

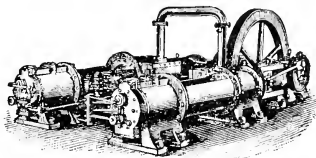
INDEX  
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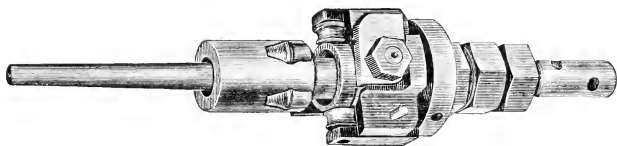
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MANUFACTURES AND TRADE.*

BY  
FRANCIS E. GALLOUPE, M.E.  
MASSACHUSETTS INSTITUTE OF TECHNOLOGY, S.B.; MEMBER AMERICAN  
SOCIETY OF MECHANICAL ENGINEERS, ETC.

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VOLUME II.

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30 KILBY STREET.  
1893.

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## FROM THE PREFACE TO THE FIRST VOLUME.

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PROGRESS in the development of material resources, in recent years, has created a large and increasing volume of engineering literature in periodicals which contain valuable papers and information, much of which is too recent, or fragmentary in character, to be found in books, or elsewhere.

This work is designed to make accessible to engineers in all branches of the profession, to special investigators, librarians, editors and others, the more important papers and articles contained in leading American and English periodicals during the last five years. To keep the list from becoming unwieldy, it was decided to limit, besides the period covered, the number of periodicals, and with these restrictions the compiler has selected each reference given by personal examination of the articles in the files.

The index is by subjects, alphabetically arranged, and makes available information now practically buried in the mass of engineering literature, or only to be extracted by the aid of some one hundred and fifty indices, and the loss of much time.

BOSTON, *May*, 1888.

## PREFACE.

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THE purpose of this Index is to supply a reference list to the important works and matters relating to engineering and its allied interests, during the period covered. It is believed that no other index fills the field of this work, which shows at a glance the principal information published on any given subject in the leading periodicals during the past five years. The periodicals indexed having been selected from a list of over one hundred and sixty periodicals will, it is thought, sufficiently cover the field of practical engineering, as nearly all important works and matters are contained among these representative papers. Foreign papers are represented by translated articles reprinted in the periodicals indexed, and there are besides incidental references to numerous others.

Within the limits set, the aim has been, by a critical examination of each article throughout the files, to preserve references to all those of permanent technical value, or practical use.

BOSTON, *June*, 1893.

## ABBREVIATIONS.

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<i>addr.</i> address.	<i>discov.</i> discovery.
<i>agric.</i> agricultural.	<i>discuss.</i> discussion.
<i>Am.</i> American.	<i>distil.</i> distillation.
<i>amt.</i> amount.	<i>distrib.</i> distribution.
<i>anal.</i> analysis.	<i>dyn.</i> dynamometer.
<i>app.</i> apparatus.	<i>econ.</i> economy, economical.
<i>aqued.</i> aqueduct.	<i>effic.</i> efficiency.
<i>atmos.</i> atmosphere.	<i>elec.</i> electric.
<i>aut.</i> automatic.	<i>eng.</i> engineering.
<i>batt.</i> battery.	<i>es.</i> estimate.
<i>Bess.</i> Bessemer.	<i>estab.</i> establishment.
<i>Brit.</i> British.	<i>evap.</i> evaporation.
<i>bull.</i> bulletin.	<i>exam.</i> examination.
<i>cal.</i> calculating, calculation.	<i>excav.</i> excavating, excavation.
<i>capac.</i> capacity.	<i>exhib.</i> exhibition.
<i>cath.</i> cathedral.	<i>exp.</i> expense.
<i>C. E.</i> civil engineer.	<i>expt.</i> experiment.
<i>Cens.</i> Census.	<i>fret.</i> freight.
<i>centrif.</i> centrifugal.	<i>galv.</i> galvanometer.
<i>chem.</i> chemistry.	<i>gov.</i> governor.
<i>condens.</i> condensing, condensation.	<i>h.</i> house.
<i>cor.</i> correspondence	<i>h. p.</i> horse power.
<i>corrug.</i> corrugated.	<i>hist.</i> history.
<i>Corp.</i> Corporation.	<i>hor.</i> horizontal.
<i>Co's.</i> Companies.	<i>hos.</i> hospital.
<i>cyl.</i> cylinder.	<i>ht.</i> height.
<i>dec.</i> decrease.	<i>hydr.</i> hydraulic.
<i>dept.</i> department.	<i>illum.</i> illuminating.
<i>des.</i> designer, design.	<i>imp.</i> improvement.
<i>desc.</i> description.	<i>inc.</i> increase.
<i>diam.</i> diameter.	<i>incand.</i> incandescent.
	<i>indus.</i> industry, industrial.

<i>ins.</i> insurance.	<i>R.</i> railroad.
<i>Inst.</i> Institute.	<i>recip.</i> reciprocating.
<i>inv.</i> inventor, invention.	<i>refrig.</i> refrigerating.
<i>locom.</i> locomotive.	<i>rep.</i> report.
<i>M. E.</i> mechanical engineer.	<i>resist.</i> resistance.
<i>mach.</i> machine, machinery.	<i>Ry.</i> railway.
<i>manuf.</i> manufacture.	<i>san.</i> sanitary.
<i>max.</i> maximum.	<i>sec.</i> second.
<i>min.</i> minute.	<i>Soc.</i> Society.
<i>mo.</i> motive.	<i>spec.</i> specification.
<i>mt.</i> mountain.	<i>sq.</i> square.
<i>munic.</i> municipal.	<i>st.</i> street.
<i>mut.</i> mutual.	<i>stat.</i> statistics.
<i>n.</i> note.	<i>str.</i> steamer.
<i>nav.</i> navigation.	<i>sup.</i> supplement.
<i>obs.</i> observations.	<i>teleg.</i> telegraph.
<i>pass.</i> passenger.	<i>teleph.</i> telephone.
<i>pat.</i> patent.	<i>temp.</i> temperature.
<i>pneu.</i> pneumatic.	<i>topog.</i> topographical.
<i>pop.</i> population.	<i>util.</i> utilization.
<i>por.</i> portrait.	<i>vac.</i> vacuum.
<i>pph.</i> pamphlet.	<i>vel.</i> velocity.
<i>pro.</i> proceedings.	<i>ventil.</i> ventilation.
<i>proc.</i> process.	<i>wrt.</i> wrought.
<i>prog.</i> progress.	<i>wt.</i> weight.
<i>pyrom.</i> pyrometer.	

# NAMES OF PERIODICALS INDEXED,

WITH THEIR ABBREVIATIONS.

Cassier's Magazine. *Cassier's*  
 Electrical Engineer, N. Y. *El Eng*  
 Electrical Review, London. *El Rev Lond*  
 Electrical Review, N. Y. *El Rev*  
 Electrical World, N. Y. *El Wld*  
 Engineer, The, London. *The Eng*  
 Engineering, London. *Eng*  
 Engineering Magazine, N. Y. *E Mag*  
 Engineering and Mining Journal, N. Y. *E & Min*  
 Engineering News, N. Y. *E News*  
 Engineering Record, N. Y. *E Rec*  
 Journal of the Franklin Institute, Phila. *F Inst*  
 Power, N. Y. *Pwr*  
 Proceedings of the Institution of Civil Engineers, London.  
*Inst C E*  
 Proceedings of the Institution of Mechanical Engineers, London.  
*Inst M E*  
 Proceedings of the Society of Arts, Boston. *Soc Arts Mass*  
 Railroad and Engineering Journal, N. Y. *R & Eng*  
 Railroad Gazette, N. Y. *R Gaz*  
 Scientific American Supplement, N. Y. *Sc Am Sup*  
 Street Railway Journal, N. Y. *St R J*  
 Technology Quarterly, Boston. *Tech Q*  
 Transactions American Institute of Mining Engineers, N. Y.  
*Am Min*  
 Transactions American Society of Civil Engineers, N. Y. *Am C E*  
 Transactions American Society of Mechanical Engineers, N. Y.  
*Am M E*

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## OTHER PERIODICALS INCIDENTALLY INDEXED IN PART.

American Engineer; Annales des Ponts; Building News, London; Century Magazine; Cosmopolitan Magazine; Forum; Le Genie Civil; Harper's Monthly; Industries; Iron Age; Journal of the Assoc. of Eng. Societies; The Locomotive; New England Magazine; Nineteenth Century; North American Review; Scribner's Magazine, etc.

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*E News* \* Jan 11-**90**; (full) *R & Eng* Feb. Mar, Apr -**90**

**Alloyage** and igneous cementation, Elbers *E & Min* Nov 16-**89**

**Alloys**, strength, Unwin *Eng* Oct 4-**89**; Roberts-Austen Mar

16, 23, Apr 6-**88**, do. research committee report Nov 6, 6, \* 13

-**91**; do. properties (full) *E & Min* \* Apr 9, 16-**92**; strength

at different temps., Unwin Jan 11-**90**, do. *The Eng* Oct 4-**89**;

new and eng. applics., Garrison *F Inst* \* June, July, \* Aug, \*

Sep -**91**; Robert's report discuss., insets (full) *Inst ME* \*

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*Sc Am Sup* Roberts-Austen (full) \* Dec 8, 15, 22-**88**,

strength at different temps., Unwin Nov 23-**89**, use in art metal

work, Roberts \* Aug 2-**90**, report (full) \* May 28-**92**. See

also STEEL alloys

**ALUMINUM**, and alloys, relative value, Pemberton *El Rev* Oct 6

-**88**; manuf. in electric furnace, Dagger *El Rev Lond* Sep 27

-**89**; copper and manganese, properties, Cowles, abs. *Inst CE*

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**BEARING** metal, Dudley *F Inst* Feb, Mar -**92**, *Sc Am Sup* Apr 2-**92**

**CHROMIUM** and iron, Hadfield (full) *Eng* Sep 23, 30, 30, \* Oct 7,

14-**92**; chrome pig iron and steel, Brustlein *R & Eng*

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**ELECTROLYTIC** decomposition and preparation, Roberts-Austen

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**FERRO-chrome**, Brustlein, *E & Min* Feb 1-**90**; iron and silicon,

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**MANGANESE**, copper and aluminum, properties, Cowles, abs. *Inst*

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**NICKEL** and iron, magnetic properties, Hopkinson *El Rev Lond*

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Aug 8-**90**, do *El Wld* \* Sep 6-**90**; nickel and steel, Riley (full) *Sc Am Sup* Aug 24-**89**. See also NICKEL alloys

STEEL, and chrome pig iron, Brustlein *R & Eng* Aug **88**; and nickel, Riley (full) *Sc Am Sup* Aug 24 **89**, do. Mar 22-**90**.  
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**Allport**, James *Eng* Apr 29-**92**, *The Eng* Apr 29-**92**

**Alphand**, Jean C. A. *Inst C. E.* v 107-**92**

**Alpine** engineering, Vernon-Harcourt, insets *Inst C E* \* v 95 **89**

**Aluminum** *Am M E* an expt. with, Christie v 13-**92**; *Am Min* properties, A. E. Hunt (full) v 18. and other metals compared. Keep (full). v 18-**90**; *Cassier's* production, E. P. Allen \* Feb. \* Mar -**92**

*El Eng* problem future, from chemical standpoint. Wahl June 3-**91**; *El Rev Lond* do Aug 21, Sep 4-**91**; Guillaume May 8, properties, Hall, June 12-**91**; *El Rev* (name) 'Alum' for, O. Smith May 30; probable future, Wahl, (full) June 13-**91**; *El Wld* do (full) June 6, discuss. 13-**91**; properties. Hall May 30; 'Alum' (name). O. Smith 30-**91**

*Eng* Dagger Oct 18-**89**; Hunt, Langley and Hall, Mar 28, Apr 18-**90**, *E & Min* do. Mar 8, 15, 22-**90**, Ingalls, Jan 2-**92**

*E News* Feb 16-**89**; properties. Hunt. Feb 22, Mar 1; comparative cost Nov 1, production, Hall proc. \* 8-**90**; Hunt (full) Feb 28, Mar 7, July 11-**91**

*E Rec* processes, Sep 5-**91**; *F Inst* Henderson, Oct -**88**, Roscoe, Sep -**89**, problem, Richards. Mar -**91**; *Inst C E* abs. v 110-**92**, *Dingler's* 284-**92**; *Locom* Apr -**92**

*R Gaz* Hunt, Apr 29-**92**; *Sc Am Sup* and sodium, Sep 15-**88**, Henderson (full) Jan 5-**89**, present status, Packard, Jan 9, action of liquids on, Lunge, Mar 5, Ingalls, May 28-**92**, *E & Min*; *Soc Arts Mass* Hunt (full) \* -**91**, do. inset *Tech Q* \* Apr -**91**; *The Eng* Aluminium Co. Aug 3-**88**; *Tech Q* in iron and steel, direct det., Drown, Oct -**91**

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- 91-88, *Assoc Ings Liege* -87; Bobby *Sc Am Sup* Feb 2, (and silicon) production in elec. furnace (Cowles proc.), Dagger (full) \* Nov 30-89
- BRONZE and brass, as materials for propellers, Cowles *Am Min* v 18-90; do (full) *Sc Am Sup* Apr 12-90; bronzes, diagram *E News* \* Feb 8-90
- CARBURETTED iron, in. Keep *Eng* June 27-90
- CAST iron, in. Keep *Am Min* v \* 18-90; ed., Keep *Eng* Aug 31, 31-88; do *E & Min* \* Aug 18-88, do. \* Jan 25-90
- CASTNER, sodium and aluminum procs. *E & Min* \* Aug 18-88 *Eng*
- COWLES proc. in England *El Wld* \* Sep 29-88
- DEVILLE-Castner proc. *Eng* Mar 22-89
- DRAWING press, al. in, O. Smith *Am Min* v \* 18, 18-90, do. *Eng* \* Aug 29-90
- ELECTRIC production, Brown *El Eng* \* Apr 29-91, do *El Rev Lond* May 22, 29, June 26-91, do *El Rev* May 2-91, do (full) *El Wld* May 2, Crocker, discuss. 16-91; Stoke-on-Trent plant, England (full) *E & Min* \* Sep 22-88; reactions, Bucherer, Jan 6, Farmer, 27-91; elec. smelting, Bobby *Sc Am Sup* \* July 13-89; Farmer, July 25, reactions in Aug 1-91
- FERRIC cake (for sizing paper) *Sc Am Sup* Nov 9 89, *Chem Tr J*
- FLUORIDE, electrolysis of. Minet *El Eng* Dec 10-90, *El Rev Lond* Dec 19-90, *Compt R*
- GRABAU's method, ed. *Eng* Dec 20-89, abs. *Inst C E* v 101-90, *An Mines, Genie Civil* v 16-89, v 17 May -90
- HEROULT proc., Dewey *Am Min* \* v 18-90; *El Wld* \* Nov 17-88, \* *Industries*; *Eng* Oct 10-90; (full) *E & Min* Dec 1-88, and Cowles, Lowrey cor. Apr 27-89; Grabau's method, abs. *Inst C E* v 101-90, *Genie Civil* v 16-89, 17 May -90; *Sc Am Sup* \* Dec 8-88
- INSTRUMENTS of precision, Blake *Am Min* v 18-90
- MANUFACTURE and industry, value, Dagger, ed. *El Rev Lond* Apr 8, July 15, Aug 19, Sep 2-92; Deville-Castner proc. *Eng* Mar 22, ed. \* Aug 2-89, Lauffen-Venhause works \* Feb 20-91; improvements in, n *E & Min* May 24, Grabau's method, Ichon Aug 16-90, *An Mines*; and uses, Hunt *E News* May 5, expt. with, Christie 19-92, do., Hunt (full) *F Inst* Apr -92; extraction on a commercial basis, Seymour, Roscoe (very full) *Sc Am Sup* Aug 24-89, Hall proc. \* Feb 1, (pure) (full) \* June

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7-90, value, *Dagger* Aug 15-91, Hunt (full) Apr 23, May 14 etc -92; *The Eng* \* Nov 21-90

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SULPHIDE proc. and ap., Emanuel's *Sc Am Sup* \* Feb 6, formation, Bucherer, Dec 24-92, *Chem Trade J*

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U. S. production, Packard *E & Min* July 11-91

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**Amalgams**, electric conductivity of, Weber, abs. *Inst C E* v 92-88, *Central Elek* -87

**America**, Fourth centennial Spanish exhib. *F Inst* Jan -92; improvements (boasting), Sweet *The Eng* May 6-92, *Am Machinist*; manufactures, recent growth *The Eng* Nov 25-92; American Powers conference, Henderson *Sc Am Sup* June 22-89. See also UNITED STATES

**Ammonia** and tar recovery from blast furnace gases *E & Min* \* May 12, 19-88; liquor utilization, Humphreys *Sc Am Sup* May 19, use as refrigerating agent, Lightfoot, 26-88, production from coal. Mond (full) \* Sep 28-89; properties, De V. Wood *Am M E* \* v 10-89, experimental determination of latent heat of, Jacobus \* v 12, 12-91; liquid, composition and manufacture, Strombeck *F Inst* July, n Aug -92. See also under CHEMISTRY

ENGINES, aqua, theory and tests on Edison incand. lighting plant. Magovern *Am C E* \* v 19-88, ed. *The Eng* July 19-89

**Ampere**, Andre M. n *Sc Am Sup* Dec 1-88

**Anæsthesia**, discovery *Locomotive* Nov -89, anæsthetics, Chis-olm *Sc Am Sup* Apr 21-88

- Anderson**, Henry J. C. *Inst C E* v 106-**91**
- Anemometers** testing, Gieseler *E Rec* \* July 13-**89**
- Angle**, the economical, Honey *Sc Am Sup* \* Jan 17-**91**
- Angle-iron** bevelling machine *The Eng* \* June 6-**90**; tests, Loweth *E Rec* Feb 1-**90**, *J Assoc E Socs*
- PRISMS, Gieseler *E News* \* May 12-**88**
- Animals**, animal arithmetic, Royer *Sc Am Sup* Feb 2-**89**, *Pop Sci*; as a motor-machine, Thurston *Cassier's* Feb -**92**; how the world appears to, *Sc Am Sup* Jan 12-**89**; language of, Duthiers Feb 13-**92**, *Pop Sci*
- Annealing** iron or steel, non-oxidizing proc., H. P. Jones *E News* \* Jan 2-**92**
- Antagonism**, Grove *Sc Am Sup* June 9-**88**
- Antartick** exploration, Griffiths (full) *Sc Am Sup* Jan 10-**91**
- Anthony**, W. A., por. *El Wld* \* Feb 1-**90**
- Antimony** ore dry concentration, Heard *E & Min* Feb 23-**89**, Kemp, Jan 2, smelting, English proc., Rodger, Mar 12-**92**, *J Soc Chem Ind* Jan 30-**92**; *Locom* May -**92**
- Anthropology**, Evans *Sc Am Sup* Nov 15-**90**; anthropolog. work in Am., Starr *Pop Sci* \* July -**92**
- Apatite** mining in Canada *Sc Am Sup* Dec 8-**88**, *E & Min*
- Aranas** Pass, Texas, imp. *E News* \* Aug 30, Haupt, cor. \* Sep 13-**90**
- Arc**, length of, method of determining, Hartl, abs. *Inst C E* \* v 107-**92**, *Zeit Deut Ing* -**91**
- Arch**, Arthur J. E. *Inst C E* v 101-**91**
- Archibould**, Ralph *Inst C E* v 101-**90**
- Archaeological** discovs. in Ohio *Sc Am Sup* \* Aug 27-**92**, *Cal Mag*
- Arches**, masonry, stability of loaded, Wurtele, and discuss. *Am C E* \* v 23-**90**; the arch, Richardson *Eng* \* Jan 13-**88**; do. *Sc Am Sup* \* Mar 3-**88**; templet for, various thickness *E News* \* Mar 8-**90**; wet, German method of repairing \* Dec 13-**90**; max. stresses, Werner (full) *F Inst* \* Oct, inset \* Nov Dec -**92**; arched ribs and voussoir, Martin *Inst C E* \* v 93-**88**; dead and live loads on masonry, McClintic *Lehigh Eng J* June-**88**; error in theory of masonry, Baker *R Gaz* \* May 31-**89**
- EQUILIBRIUM, curves, Suplee *Am M E* \* v 11-**90**
- GOUR Noir viaduct, Vezere river, Uzerche, France, inset *E News* \* Aug 18-**92**

**Arches**, MT. Vernon viaduct *E News* \* Sep 1-**92**

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SKUEW or spiral construction, Cincin. & Rich. R., Paret *Lehigh Eng J* Feb -**88**. See also BRIDGES, skew arch, Oakley.

**Architects**, Am. Inst., pro. *E Rec* Oct 27-**88**, constitution, Dec 7-**89**, pro. Oct 31, Nov 7-**91**

**Architect's** and engineer's fee. German schedule *E Rec* June 15; convention Nov 30-**89**; legal decision, Dec 15, 22-**88**; the architect and the engineer, ed. *R & Eng* Dec -**90**, *Pop Sci*: offices, Burnham, Rookery, Chic. *E Rec* \* Jan 11, Shepley \* Feb 15, Wilson, Phil. \* 22, Chandler, Phil.\* Mar 1, Boston. June 7-**90**, organization. Post, N. Y. \* Nov 7, McKim's, N. Y. \* Dec 5-**91**

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**Architectural** work, J. Robinson *E Mag* \* Mar; notes. Ferree, files to Dec -**92**; constructive faculty, evolution of. Burnett, Aug -**92**, construction. Monier system *E & Min* \* June 6-**91**; decoration, World's exhib., Millet *Scrib* \* Dec -**92**

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**Architecture**, art and utility in building, Ferree *E Mag* Aug, recent tendencies do. \* Sep -**91**; pessimism of modern, Edelmann, insets \* Apr; beginnings of, Kirk \* May; ornament in, Sullivan, insets \* Aug; in wood, protest, Kimbrough, Dec -**92**; physiological basis of the sense of beauty of form, Goodman (full) *Sc Am Sup* May 10-**90**. See also BUILDINGS and building AMERICAN Fine Arts Soc. bld., N. Y., doorway, inset *E Rec* \* Dec 31-**92**

APARTMENT house, Yosemite. N. Y., entrance *E Rec* \* June 27-**91**

CATHEDRAL, Albi, France, inset *E Rec* \* Apr 18-**91**; builders of the cathedrals, Snow *N E Mag* \* Dec -**92**; Siena cath., Pisano *Sc Am Sup* \* Oct 19-**89**

CHATEAU Epreville-Martainville, France, inset *E Rec* \* Sep 26; (Lot) France, inset \* July 25-**91**; Josselin, Brittany, inset \* Jan 23-**92**

CHICAGO, Ill., Herald building, inset *E Rec* \* Nov 14-**91**; sketches in *Sc Am Sup* \* Dec 3-**92**

**Architecture**, CHURCH at Chateaufeuf (Charente), France, inset *E Rec* \* Sep 19; of St. Paul, Dax (Landes), France \* June 6-91

CITY Hall, the, in Am., Ferree, insets *E Mag* \* Nov -92; Bremen, Germany, inset *E Rec* \* Dec 12-91; Cologne, Ger., entrance, inset \* Apr 2; Hotel de Ville, Poitiers, France, inset \* Dec 10-92

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COUNTRY houses, Cambridge, etc., inset *E Rec* \* Jan 17-91; Cohasset, Mass., interior, inset \* Apr 23-92; English, inset \* Aug 29-91; Arthur Little's, Boston, inset \* Feb 20; Geo. Macculloch, Morristown, N. J., inset \* Mar 26; Maiblehead Neck, interior, inset \* Jan 16-92; Swampscott, Mass., inset \* Aug 15, Elihu Thomson's do., inset \* May 9-91

COURT house, Beauvois, France, inset *E Rec* \* Nov 19-92

FRANKFORT-on-Main, Ger., Union R. pass. station, insets *E Rec* \* Sep 5-26 \* Dec 5-91. See also BUILDING

GALLERY Victor Emanuel, Milan, inset *E Rec* \* July 30-92

LIBRARY, Tilden Trust, N. Y., proposed, Bigelow *Scrib.* \* Sep -92

MEAT market, old, Haarlem, Holland, inset *E Rec* \* Feb 14-91

MOBBEY Hall, Cheshire, England, inset *E Rec* \* Nov 26-92

MUSEUM building and arrangement, Ferree *E Mag* \* Nov -91; Amsterdam, Holland, inset *E Rec* \* Feb 28; Hague, do., inset \* May 23-91

MUSIC Hall, N. Y., main entrance, inset *E Rec* \* Feb 13-92

PALACE of Justice, Hague, Hol., inset *E Rec* \* Mar 7-91

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**Arctic** exploration, Peary expedition, Nansen's No. Pole exped. *Sc Am Sup* \* Nov 26, 26-92

**Areas** of segments *Locom* \* Jan -90, calculation, table, June -91.

See also INTEGRATOR

**Argall**, Philip, por. *E & Min* \* Dec 5-91

- Argentine** Republic, ed. *Eng* Dec 27-**89**; finance *E & Min* Apr 20-**89**; R. map *E News* \* Dec 8-**88**; Jan 26-**89**; notes, Shunk, Feb 22, Mar 22-**90**; wheat in *Sc Am Sup* Apr 14-**88**
- Arithmetic**, curiosities in figures *E News* Dec 29-**88**; peculiarities of the figure 9, Hill, cor. Feb 2-**89**; Hindu May 10; the number 142,857, cor. n Oct 25-**90**; lessons *Pwr* files -**91-92**; method of quarter squares, Blater, Glaisher (full) *Sc Am Sup* Nov 30-**89**; cube root, Wood Sep 6, do. and rapid addition, Boutelle, Nov 8-**90**; roots extracting, new method, Westervelt Apr 4-**91**. See also under MATHEMATICS
- Arkansas** mines, Branner, *E & Min* Oct 20-**88**
- Armada** (Spanish), defeat in 1588 *Sc Am Sup* \* Aug 25-**88**
- Armor**, cellulose *E News* Dec 1-**88**, steel, tests at Annapolis, Sep 20, 27 \* Oct 4-**90**. See also GUNNERY and armor
- Arms** and armor of ancient Japan, Baba *Soc Arts Mass.* -**88**
- Army**, Austro-Hungarian, Kuhn *Harper's M* \* June; Italian, Goiran \* Aug -**92**; European armies, Dodge *Forum* July -**92**; of Kukuianaland, Michaelis *Sc Am Sup* Oct 26-**89**, *F Inst*
- Arrol**, William, por. *Eng* \* Feb 28-**90**
- Arsenal**, Woolwich *The Eng* \* Oct 2-**91**
- Arsenic** determination, Canby *Am M E* v 17-**89**, *Birm* May -**88**; *Locom* June -**92**
- Art**, fine, composition and selection of a subject, Ellis *Sc Am Sup* \* June 1-**89**; use of cloisonne for decoration, Heaton (full) May 9; pictures, durability painted with oils and varnishes, Laurie June 20; Miller, Aug 22; decorative treatment of natural foliage, Stannis (full) \* Nov 21, 28 \* Dec 5, 19, 26-**91**
- Artesian** wells. See WELLS, artesian
- Artificial** limbs, Mark's *F Inst* \* May -**89**
- Artillery** service in the rebellion, Tidball *J Mil Ser Inst Mag* May -**92**. See also GUNNERY and armor; GUNS
- Arts** and manufactures, prog. rev. *F Inst* Feb -**88**. See also SOCIETY OF ARTS, London
- Asbestos** *E & Min* Jan 2-**92**; Rogers *Sc Am Sup* June 16-**88**; Canadian industry *E & Min* Sep 17-**92**; chem. composition, Donald, June 27-**91**, do. *Sc Am Sup* July 18-**91**; mining, Quebec, Ellis *E & Min* Apr 25-**91**, Canada, abs. *Inst C E* v 107 -**92**, *Am Gas Lt J* Oct 26-**91**; U. S. production, Parker *E & Min* Sep 5-**91**, *Cen Bull*; mining, manufac. and uses, Fisher *The Eng* Dec 16-**92**

**Ashburner**, Charles A., Lesley *Am Min* v 18 -90

**Ashworth**, John *Inst C E* v 95 -89

**Asphalt**, uses, Greene, insets (full) *Am Min* \* v 17 -89, do. *Soc Arts Mass* -89; industry, France, abs. *Sc Am Sup* \* July 19-90, *Genie Civil*; plates for water-proof construction *E News* \* Nov 1: price of, Oct 25-90; Trinidad *E Rec* Nov 12-92; use in irrig. works, Cal., Purcell *Inst C E* v 110 -92; nature and uses, Greene *Soc Arts Mass* -89. See also PAVEMENTS; ROADS; STREETS

**Asphalto**-genesis theory, Wurtz *E & Min* July 27-89

**Asphaltum**, Gilsonite or Uintahite, mts., Utah, Locke *Am Min* v 16 -88, Blake v 18 -90; and ozokerite, U. S., Parker, cen-bull. *E & Min* Aug 15-91; Kemp, Jan 2-92; Parker *E Rec* Aug 1-91; *Sc Am Sup* Sep 19-91

**Assaying** of lead, silver and gold, F. Clark *Tech Q* May -88; tin ores, dry, Hofman (full) May, Aug -90. See also CHEMISTRY; METALLURGY; METALS and names of metals and minerals

**Astronomy**, two remarkable coincidences, d'Auria *F Inst* Oct -88; as applied to land surveying, Downes *Inst C E* \* v 108 -92; recent science, Kropotkin *19th Cent* May -92; how to measure the invisible, Parkhurst *Sc Am Sup* Apr 18; the story of the universe, Huggins \* Sep 12; central lateral motion of the worlds of space, Wheeler, Dec 5; astronomer's work in a modern observatory 19-91; new, Ball, Feb 27-92. See also PHOTOGRAPHY, stellar; SUN; TELESCOPES, etc.

ABERRATION problems, Lodge *Sc Am Sup* \* Nov 5-92

ARCTURUS, recent conceptions, Knight. *Sc Am Sup* July 4-91

AURORA Borealis *Sc Am Sup* Mar 16-89

COMETS and meteors *Eng* Dec 30-92; five-fold *Sc Am Sup* \* Feb 18-88; Coakley, Dec 10-92

COSMOSPHERE for teaching, Bailey *Soc Arts Mass* -88

HELIOMETER, Cape of Good Hope observ. *Eng* \* Jan 3, 10 -90

HELIOSTAT, Grubb's, Smithsonian Inst., Wash. *Eng* \* May 16-90

INSTRUMENT works, Grubb's, Dublin *Eng* Dec 14-88

LICK observatory, Mt. Hamilton, Cal. *Eng* \* July 6, 27, inset \* Aug 10, 17, 31 \* Sep 7 \* Oct 26-88; Holden *Sc Am Sup* Sep 29-88; latest discovs. Nov 15-90. See also PHOTOGRAPHY, ap., Lick observ.

- Astronomy**, MARS, map *E News* \* May 18-89; physical aspects, map *Sc Am Sup* \* Sep 8-88; *Science*, do. and views, Proctor *Sc Am Sup* \* Oct 13-88, *Knowledge*; opposition, Lockyer *Sc Am Sup* \* Oct 15-92
- MERCURY *Sc Am Sup* \* Apr 26-90
- METEORITES, meteors *Locom* July -90; August *Sc Am Sup* Oct 13-88; notes, Lockyer (full) \* Feb 2; and what they teach, Hensoldt, Nov 16, 23-89; Wash. Co., Kan. Aug 23-90; meteoric finds, Foote, Feb 6-92; *Nature*; *Science*. See also ASTRONOMY, comets.
- MILKY way, Gore *Littell's* Apr 30-92
- NEPTUNE, discovery (great discoveries) *Locom* Dec -89
- OBSERVATORIES, Levander *Sc Am Sup* Aug 29, (full) Sep 5-91; Halsted ob. spectroscope *Eng* \* July 22-92; Pekin ob. *Sc Am Sup* \* Jan 12-89; Warner ob. *Eng* \* Jan 27-88. See also ASTRON., Lick-Sayre observs.
- SAYRE observ., Beth., Pa., deflection of plumb line at. Frescoln *Lehigh Eng J* June -88
- SPACE, constitution of, Hirn, bk. review *Eng* Nov 8-89, do. *Sc Am Sup* Jan 11, do. De V. Wood, Apr 5; the grants of starry space, Jan 25-90
- SOLAR spectrum, limit of, Hartley *Sc Am Sup* May 4-89, *Nature*
- STARS, in handle of big dipper, simultaneous culmination method, Marcy *E News* \* Sep 5-91; two extraordinary, Pickering *Locom* \* June -90; double \* Oct -91; age of the, Janssen *Sc Am Sup* Jan 28, Feb 4-88; distances, Oudemans, Mar 8-90; double and multiple, Knight, Oct 8-92
- TELESCOPES, photographic equatorial, Melbourne observ. *Eng* \* Dec 19-90; clock-driving ap., Grubb, insets *Inst ME* \* July -88. See also TELESCOPES.
- URANIA Institute, Berlin (Lick observ.), Holden *E Mag* \* Mar -92; planet Uranus, Gregory *Sc Am Sup* Aug 24-89
- VENUS planet *Sc Am Sup* \* Nov 12-92
- Atchison**, Arthur T. *Inst C E* v 105-91
- Atkinson**, Charles R. *Inst C E* v 100-90
- Atkinson**, William P. *Tech Q* May -90
- Atlantic** coast, subsidence of, *Sc Am Sup* Aug 22-91; navigation, prog., ed. *Eng* June 20, 27-90
- Atmosphere**, structure and cause of rain, Velschow *Am C E* \* v 23-90; vertical distribution of temperature *Eng* Nov 1, 15,

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29, Dec 6, 20-89, resistance, experimental study of, Crosby, May 30, June 6 \* 13-90, do. (full) *El Wld* \* May 24-90, do. *E News* May 31-90; atmospheric electricity, expts., Weber, abs. *Inst C E* v 99-90, *Elek Zeit* -89; optical phenomena of, Cornu *Sc Am Sup* \* Apr 27-89, the upper atmosphere, Ranyard \* Dec 19-91, circulation of, Peruter, July 9-92, *Nature*. See also AIR resistance: RAILROADS, atmospheric—train resistance

**Atoms**, atomic volume and tensile strength, Fessenden *El Wld* \* Aug 22-91; intelligent *Sc Am Sup* Nov 28-91, arrangement in space in organic molecules, Wislicenus, Feb 18-88, *Am Chem J*. See also FORCE

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**Autographs**, foreign electricians *El Wld* \* May 28-92

**Automatic machines**, Lynde's *Eng* Jan 25-89. See also SLOT machines

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- Balls**, hollow copper *Locomotive* \* Oct -91
- Balloons**, how to cross Africa in *Rev of Revs* Sep -92; construction, Myers *Sc Am Sup* Nov 30-89, history of aeronautics, Stevens (full) \* Feb 22, \* Mar 1-90. See also AIR navigation
- Bancroft**, Hubert H., por. *Sc Am Sup* \* Oct 15-92
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- Barium** (metal) *Locom* Aug -92
- Barnes**, F. W., por. *E & Min* Jan 16-92
- Barometers**, Gieseler *E News* Aug 4-88, the aneroid, do. *F Inst* \* Nov -89, do. use for measuring heights *The Eng* Mar 13-91, do. use in Western Mass. by Geol. survey, Cutter, *Tech Q* Sep -87
- Barrel machinery**, universal *The Eng* Sep 20-89
- Barrels**, cement, etc., cubic capac. n *E News* Feb 15, 22, Mar 29-90
- Barrett**, John P., por. *El Wld* \* Dec 6-90
- Barry**, William H. *Inst C E* v 100 -90
- Bartol**, B. H. *Am M E* -88, *F Inst* June -88
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- Bazalgette**, Joseph W. *Eng* Mar 20-91, (full) *Inst C E* v 105 -91, *The Eng* Mar 20-91
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- Berwind**, Charles P., por. *E & Min* \* Dec 13-90
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- BLAST furnace waste gas as fuel, effic., Jacobus *Am M E* v 17 -89
- COIL boilers, Gov't. *E News* Oct 13-88; Ward's coil, U. S. Navy \* Aug 29-91
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- LANCASHIRE, evap. of, Longridge *Eng* Apr 11, 18-90, do. *The Eng* \* Feb 14-90, Nov 6-91; three-flued, Crosland, Mar 11-92
- OVAL, two-flues, evap., abs. *Inst C E* v 91 -88, *Zeit Verb Dampf* -87
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- STEEL, open-hearth, use and testing for, Goodall, discuss. (full) *Inst C E* \* v 92 -88
- WARD's sectional *Eng* \* Apr 5-89
- WATER-tube, Knap *The Eng* May 25-88
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- Bolden**, Henry *Inst C E* v 109 -92
- Bolivia**, mineral resources, Minchin *Eng* \* July 11-90, Apr 17-91
- Bolton**, Francis J. *Inst C E* v 93 -88
- Bolts**, drift, holding power. expts. *E News* Feb 28-91, *E Rev* Nov 29-90

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- Box** nailing machine, Hodge's *Eng* \* Mar 29, 29-89, *The Eng* \* Mar 22-89
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**Branner**, John C., por. *E & Min* \* Dec 12-91

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Reading R. \* Jan. 24; stone, Elkader, Ia., Turkey river \* Apr

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with lead joints at key \* Oct 24-91; New Brunswick, N. J.,

Albany st. masonry arch \* Apr 16; Gour Noir viaduct, Vegere

river, Uzerche, France, inset (full) \* Aug 18; Mt. Vernon via-

duct \* Sep 1-92

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- BEARINGS, fixed and expan., Sinot-Pichin R. *The Eng* Oct 12-**88**
- BEAVER river plate girder, Pitts. & L. Erie R., inset *E News* \* Apr 2-**92**
- BELAJA river, Samara-Ufa R., Russia, inset *Eng* \* July 11, 25 -**90**
- BERLIN, the Moltke, Pinkenburg, iron tilt do., abs. *Inst C E* v 92 -**88**, *Deut Bauz* -**87**
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- CINCINNATI & Covington elevated R. Transfer & Br. Co., river spans of, Burr, insets (full) *Am C E* \* v 23 -**90**, (full) *Sc Am Sup* \* Dec 13-**90**
- CINCINNATI & Newport *E Rec* Sep 10, Nov 5 \* 19 \* Dec 31 etc. -**92**
- CLARENCE, Taff river, Cardiff, So. Wales. inset *Eng* \* Jan 30 \* Feb 13, inset \* Mar 6, inset \* 20, 20-**91**
- CLEVELAND central viaduct *E News* \* Dec 22-**88**
- CLYDE river, proposed *R & Eng* \* Mar -**89**, \* *Industries*
- COFFER-dam or caisson without timber or iron in its construction. R. Harris, discuss., insets *Am C E* \* v 24 -**91**, *R & Eng* May -**91**
- COLORADO river cantilever, Cal. & Ariz. R. *E News* \* Feb 23 -**89**
- COLUMBIAN exhib. steel canal *E News* \* Apr 21-**92**
- COLUMNS, z-iron, expts., Strobel *Am C E*, *R Gaz* July 13-**88**
- COMPRESSION members, Bess. steel, expts., Dagron, discuss., insets *Am C E* \* v 20 -**89**
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- CRUEIZE viaduct, Marjevois, So. France R., n *R & Eng* \* Mar -**91**, \* *Genie Civil*, *The Eng* \* June 5-**91**
- CUMBERLAND, Md., Balt. st. *E News* \* July 21-**92**
- DALMARNOCK, Glasgow, inset *Eng* \* Mar 28-**90**
- DELAWARE, Lack. & W., White's plate girder *R & Eng* \* July -**91**
- DRAW-BRIDGES, swing, turning by elec. power *El Rev* \* Apr 20-**89**; hydr. machinery, Fidler *Eng* Feb 19-**92**; end-adjusting gear for, Turner *E News* \* Apr 16. vertical lift, method of operating \* June 30-**92**; lock. Penn. R. *R Gaz* \*

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bridges, Duluth
- DU VIAUR viaduct, proposed, inset *E News* \* Nov 30, 30-**89**
- EARN viaduct. Caled. R., Scot.. renewal, inset *Eng* \* Sep 16-**92**
- ENGLISH Channel, proposed, Schneider *Eng* Sep 27-**89**, ed.,  
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GARABIT viaduct *E Rec* \* Mar 7-**91**; Eiffel, abs. *Inst C E* v 95 -**89**, *Compt r* July **88**

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GREENOCK & Gourock R., inset *Eng* \* Feb 22 **89**

GROUSE valley R. *E Rec* \* Jan 19-**89**

GOUR Noir viaduct, Vegere river, Uzerche, France, inset (full) *E News* \* Aug 18-**92**

HACKENSACK draw-bridge, Erie R. *R Gaz* \* July 20-**88**

HARLEM river, N. Y. *E News* \* May 26-**92**; *E Rec* \* Jan 21, erection \* July 7-28 \* Aug 11, Sep 1-**88**; lift *R Gaz* June 10,

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temporary draw-br. pile supports, Triest \* Aug 19-92. See also BRIDGES, draw-bridges, Manhattan

HAWARDEN, Dee river, Fox *E News* \* Sep 15-92, inset *Inst C E* \* v 108 -92

HAWKESBURY R., New So. Wales, Burge *Eng* Mar 7-90; motions, observed in, Ewald, cor. \* Feb 6-91, do. *E News* \* Mar 14-91; Jan 5, testing, July 20-89; erection *E Rec* \* May 30 \* June 6-91; Burge, insets *Inst C E* \* v 101 -90; placing the center span *R Gaz* \* Aug 10-88; *Sc Am Sup* \* Aug 11-88; *The Eng* Sep 7-88, June 14, Sep 13-89, Burge Mar 7-90

HIGHWAY, Cincin. cantilever, Kaufman, insets (very full) *Am C E* \* v 27 -92; Glasgow road, Grt. West. R., inset *Eng* \* Aug 22-90

*E News* Waterford, N. Y. \* June 1; iron viaducts for, Waddell, 8; \* July 6-89; supervision, proposed system, Stowell, Mar 22, 29; legislation, proposed, Breithaupt, cor. Apr 19; designs, Owen, cor. May 10; the bridge of the future, Dibbles \* June 21; Guilderland, N. Y. (unsafe), Stowell, cor. \* Aug 30; wire suspen., Victor, Cal., etc. \* Nov 8-90; plate girder, Brookline, Mass., inset \* Sep 19-91; Rockford, Ill., State st. plate girder, inset \* Feb 27; Stearns truss for \* July 21-92

*E Rec* viaducts across R. tracks, Gayler, Sep 19-91, do. *J Assoc Eng Socs*, iron and steel, Waddell, discuss. Nov -88, abs. *Inst C E* v 95 -89; floors of st., Gayler, abs. v 93-88, *J Assoc Eng Socs* -88; Kelvin river road, Glasgow *R & Eng* \* Nov -91; Niemen river, Olita, Russia \* Dec -92; 158th st., over N. Y. Cen. R. *R Gaz* \* Nov 9-88; Nova Scotia \* May 3-89; over R. tracks, experience with, Gayler, Aug 21 -91; brick, Persia *Sc Am Sup* \* Dec 31-92

HOOGHLEY river Jubilee R., India, Leslie *Eng* Jan 27-88, erection *E Rec* \* Oct 4, 25-90, do. discuss., inset (full) *Inst C E* \* v 92-88, do. *The Eng* Feb 10-88

HOWE truss, timber, Willamette river, Albany, Or. *Eng* \* Jan 6-88; timber structures, western Am. 180 and 250-ft. span, inset \* Oct 7-92; determination of length of strut, D'Armit, cor. *E News* \* Nov 16, 23, strut prob. Dec 14-89; Or. Pac. R., strain sheets, inset \* Apr 26, 26; 50 and 68-ft. spans. Can. Pac. R. \* May 24-90; R., Jameson *R & Eng* \* Mar \* May \* June \* Aug \* Sep \* Oct \* Dec -90 \* Jan \* Feb -91; Willamette

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river, timber, Albany, Or. *R Gaz* \* Apr 19-**89**, *Sc Am Sup* \* Mar 17-**88**, *Eng*

HUDSON river, first design, Pope's flying lever, 1811 *R & Eng* \* May -**88**; tunnel, ed. *E News* May 31-**90**

INDIA, bridging alluvial Punjaub rivers, ed. *Eng* Jan 31, notes, Feb 14, Mar 28-**90**; Chitravati, discuss., insets (full) *Inst C E* \* v 103, 104 -**91**. See also BRIDGES, Chitravati—Hooghley river—Sukkur

IRON, wts. of, formulas, Beatty *Lehigh Eng J* June -**88**

JERSEY City, Harsumn's Cove transfer, Benset, insets *Am C E* \* v 19 -**88**

KANAWHA river *E Rec* \* Aug 17, 31 \* Sep 14, 28 \* Oct 5, 19, 26 -**89**

KENNEWICK, No. Pac. R. *R Gaz* \* Nov 8-**89**

KENTUCKY river, or Tyrone cantilever, inset *E News* \* Apr 5-**90**; Irvine, Ky., erecting \* May 26 -**92**

KENTUCKY & Indiana, Louisville *Eng* \* Jan 27-**88**; Moulton, abs. *Inst C E* v 92 -**88**, *Am C E* Sep -**87**

KINGPOST truss, wrt. iron shoe for, Cin. N. Or. & Tex. R. *E News* \* Apr 6-**89**

KINZUA viaduct, J. Clarke *Am M E* \* v 11-**90**; 1882, T. Clarke *E News* July 5, n, Aug 30-**90**

LAGAN, Belfast *The Eng* \* Aug 22, 29, 29-**90**

LANDSLOWNE, at Sukkur, Indus river. See BRIDGES, Sukkur

LOA viaduct, Antofagasta R., Bolivia 336 ft., highest in world *E News* \* May 18-**89**, *R & Eng* \* June -**89**, *Sc Am Sup* \* Mar 15-**90**, *The Eng* \* Apr 19, 19, inset \* 26-**89**

LONDON, England, Blackfriars, Thames river, Lond. Chat. & Dover R., Cruttwell, discuss., inset *Inst C E* \* v 101 -**90**, *The Eng* Mar 21-**90**

THAMES river, proposed *E Rec* \* Nov 19-**92**, do. Ratcliffe to Rotherhithe, and ed. *The Eng* \* Oct 28, 28-**92**

TOWER. See BRIDGES, Tower, London

LONG span, discussion of, Lindenthal *E News* \* Mar 3, 10, 24; very long span, proposed design, Warren \* June 30-**88**; and North river, N. Y., Lindenthal, Nov 9, 16, 23-**89**; table *R Gaz* May 2-**90**

LYONS, Rhone river, Nansouty, abs. *Inst C E* v 106 -**91**, \* *Genie Civil* v 19 -**91**; great, Fournere & Croix, Rousse *Sc Am Sup* \* Oct 24-**91**

- Bridges, MALLECO** viaduct, Chili, Mamy. abs., inset *Inst C E* \* v 104-**91** *Genie Civil* \* v 18 -**91**
- MANARVATER timber viaduct, New Zealand *E Rec* \* Jan 4-**90**
- MANHATTAN, Harlem river, N. Y. *Eng* \* May 4 **88**, *E News* \* Feb 4, Sep 8-**88**. See also BRIDGES, Wash.
- MARBLE Creek viaduct *E Rec* \* Apr 18-**91**
- MARENT Gulch high viaduct, No. Pac. R. *R Gaz* \* Apr 26-**89**
- MARGHERITA, Rome *R & Eng* \* June -**92**, *Industries*; Turin. Po river, abs. *Inst C E* v 92 -**88**, *Giornale Civ* -**87**
- MASONRY, with semi-free joints, Cunningham *Eng* \* May 6. *Sc Am Sup* \* June 25-**92**, *An Ponts*
- MATTABESSETT river, E. Berlin, Ct., inset *E News* \* Apr 2-**92**
- MAUCH Chunk suspension, Hildebrand *E News* \* Feb 25, Mar 10-**88**
- MEMPHIS R., Miss. river, Tenn. *E News* \* May 12, inset \* June 16, inset \* Sep 15-**92**; erection *E Rec* June 20 \* July 25 \* Oct 17-31 \* Nov 7-**91** \* May 14-**92**; and ed. *R Gaz* \* Feb 21 -**90**, June 26-**91** \* May 13-**92**; *The Eng* Aug 3-**88**
- MICHIGAN Cen. standard, with 3 inside guard rails *R Gaz* \* Nov 1-**89**
- MISSOURI Pacific, inset *E News* Feb 14-**91**
- MOLDAU viaduct, at Cervena *E News* \* Apr 19-**90**; Huss, abs., *Inst C E* v 98 -**89** \* *Woch ost Ing* -**89**
- MONTREAL, proposed *E News* May 31-**90**
- MORAND, Rhone river, Lyons *The Eng* \* Oct 16, 23, 30-**91**
- NEEDLES, cantilever, Col. river, Cal., Atlan. & Pac. R., inset *R Gaz* \* Apr 25-**90**
- NEWARK Dyke, Grt. Northern R. *The Eng* \* Mar 7, 21-**90**
- NEW Brunswick, N.J., Albany st. masonry arch *E News* \* Apr 16-**92**
- NEW London, Ct., Thames river. See BRIDGES, Thames river
- NEW Orleans, Miss. river, projects *R Gaz* \* May 16 \* July 11-**90**
- NEWPORT viaduct, Isle of Wight, inset *Eng* \* Jan 25-**89**
- NEW York Cen. double track with solid plate floor *R Gaz* \* May 17-**89**
- NEW York and N. J., Clark report, inset *R Gaz* \* Sep 23 *Sc Am Sup* Oct 22-**92**. See also BRIDGES, Harlem, Manhattan-North river, railroad, Washington, etc.
- NEW York, Prov. & Boston ballast floors *E News* \* Mar 1-**90**
- NEW York Rapid Transit R. viaduct, proposed *E News* \* Oct 31-**91**

**Bridges**, New York Terminal R., Hudson river, proposed *E Rec* \* Jan 14-**88**

NIAGARA suspen., towers reconstruction, Buck, *Am C E* v 17 -**87**, abs. *Inst C E* v 93 -**88**

NORFOLK & Carolina transfer, inset *E News* \* Jan 30-**92**

NORFOLK & Western standard plans *E News* \* June 23, 28-**88**

NORTH river suspen., N. Y., proposed, Macqueen *Cosmop* Aug **92**; Lindenthal *Eng* \* May 9-**90**; and world's great *E News* \* Jan 14, 14, discuss. of long span bridges, Lindenthal \* 28, 28, Feb 4-**88**; July 20-**89**; Lind. reply *E Rec* July 20-**89**; *Sc Am Sup* \* Nov 7-**91**, *R Rev*: Lindenthal's project, criticism, Ende *The Eng* \* May 17, Lind. Aug 30-**89**

OAKLEY skew, Cin. & Rich. R., design and erection Crowell, insets *Am C E* \* v 23 -**90**

OHIO, Cin. & Covington Elevated R., Burr, *Am C E* v 23-**90**, abs. *Inst C E* v 103 -**91**

OHIO Connecting R., Pitts, Pa., floating 523-ft spans into place, inset *E News* \* Sep 20, false works \* 27-**90**, do. (full) *E Rec* \* Sep 13, erection \* Dec 13-27-**90** \* Jan 3 -**91**, Strobel, abs. *Inst C E* v 103 -**91**; inset *R Gaz* \* June 20, Aug 22, inset \* Sep 12-**90**

OHIO river, completion of, *E News* Jan 12-**89**

OMAHA, erection *E Rec* \* Mar 9, 16-**89**; suit *R Gaz* July 31-**91**

ORISKANY, N.Y., Cen. & Hud. R. R., inset *E News* \* Dec 7-**89**

OSCHUTZ viaduct *R & Eng* \* May -**88**

PADERNO viaduct, Adda river, Sacheri, abs. *Inst C E* v 98 -**89** \* *L'Ingeg Civile* -**89**, *R Gaz* \* Sep 14-**88**

PALATINE, Tiber river, Rome *R & Eng* \* Mar -**92**

PARALLEL-chord, tables for finding stresses in, Hitchcock, inset *E News* May 23-**91**

PASSENGER ferry, N.Y. L. Erie & W. R. *E News* \* Apr 6, cor. 20-**89**

PATIALA-Bhatinda R., iron-work *The Eng* Nov 16-**88**

PECOS river, Southern Pac. R., Tex. *E News* \* Feb 6-**92**

PENCOYD shop *E Rec* \* July 27 \* Aug 3-**89**

PENN. R. frt. car transfer, Jersey City, inset *E News* \* Jan 18, 18 -**90**; draw-bridge lock *R Gaz* \* July 27-**88**

PHILADELPHIA, Market st. cantilever, Amweg *E News* Apr 7-**88**

PIERS, Red river concrete, Purdon *E News* \* June 2-**88**; French masonry and detail \* Sep 5-**91**; Stettin, Ger., masonry removal \* July 14; screw piles for \* Aug 4-**92**; moments, graph.

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- method of obtaining, Lindenberg *F Inst* \* Nov -89; and river crossings, Otagawa *R & Eng* \* Nov \* Dec -88, Jan -89; repairing under water, Rossignol \* Sep -90, *An Ponts*
- PILE and trestle, Robinson *E News* Apr 7-88. See also BRIDGES, railroad; PILING; TRESTLES
- PINS, fibre strain in, J. Johnson *E News* \* Jan 28, Du Bois, cor. Mar 10, strains in, Fowler, cor. \* 24; and eye-bars, proportions, Stowell, Mar 31-88
- Po river, at Casalmaggiore, Parma-Brescia R., erection *E Rec* \* May 5-26-88, abs. *Inst C E* v 95 -89, *L'Ingeg Civil* -88
- POLLET swing. See BRIDGES, draw-bridges
- PONTOON, Indian boat, Fenner *R & Eng* \* Sep -88
- PONY lattice, N.Y., West Shore & B. R. *R Gaz* \* Sep 21-88
- PORTABLE, Brochowski's *Eng* \* Apr 5; Paris exhib. \* Aug 2-89; *E News* May 26 \* Sep 1-92; French iron, Talansier *E Rec* \* Jan 12-89 \* *Genie Civil*; metallic, for quick erection, Pichault, abs. *Inst C E* v 91 -88, *Assoc Ings Liege* -87
- PORTAL bracing, anal. of stresses, Cain *E News* July 13-89
- PORTSMOUTH & Gosport floating, Harris *Eng* \* Oct 7, *E Rec* Oct 15, *Sc Am Sup* \* Nov 19, *The Eng* \* Sep 23-92, *Inst M E*
- POUGHKEEPSIE, cantilever, Hudson river, construction, O'Rourke, insets (full) *Am C E* \* v 18 -88, inset *E & Min* Feb 2-89, *E News* Jan 7-88 \* Feb 16-89, abs. *Inst C E* v 96 -89, T. Clarke *Sc Am Sup* \* May 19-88, *The Eng* Sep 21-88
- PROVIDENCE, R.I., Point st., guard gates, Bullock, insets *Am C E* \* v 20-89, *E Rec* \* Nov 28-91
- QUERETARO aqueduct, Mexico *E News* \* June 2-88
- QUINDARO, caissons and cribs, inset *E News* \* Apr 4-91
- RADIAL truss, F. Smith, cor. *E News* \* Apr 11-91
- RAILROAD, wts. of, Du Bois, inset, new form of strut, Strobel *Am C E* \* v 18-88; Am., Cooper, discuss., insets (very full) \* v 21, 21 -89; R. bed for bridge structures, Woolson *Am M E* \* v 9 -88; bridging canons lengthwise, Hinckley, inset \* v 26-92; Burge, Walton, Cruthwell *Eng* Mar 7-90; Am. viaducts, Greiner \* Aug 14-91; Glenury viaduct renewing in Scot., Caled. R., inset \* Sep 2, Earn viaduct \* 16-92; Am., Cooper, (full) *E & Min* \* Oct 5-26 \* Nov 2, 9, 30-89, do. *E News* \* July 6-89; Am., origin and evolution, Greiner \* June 6-91; use of steel for, symposium, Mar 26, Apr 2, Aug 25-92; wrt.

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iron floor beam, test. Boller *E Rec* \* Dec 10-**87**; new form of strut. Strobel, abs. *Inst C E* v 95-**89**; Dufferin. Hawkesbury. discuss., insets (full) \* v 101-**90**; Am., origin and evolution. Greiner *R Gaz* \* June 5-**91**; recent construction of. Ritchie *Sc Am Sup* Jan 17-**91**, *J Assoc Eng Socs*; spacing cross-girders in. MacKensie *The Eng* \* Mar 6-**91**; Moenchenstein failure. Switz., Ende \* Feb 19-**92**. See also under BRIDGES. Howe truss, and names of places and railroads. Forth—Loa—London. Blackfriars—Oakley, etc.; PILING; TRESTLES

DESIGNING, disputed points in. Waddell, discuss., insets (very full) *Am C E* \* v 26-**92**, *E News* Dec 12, 26-**91**, *E Rec* Dec 12, 26-**91**, Jan 9-**92**, *R Gaz* Oct 14, 28, Nov 4, 25-**92**

GUARDS, inside and outside. Dailey *E News* \* Jan 28, 28-**88**; rerailing, Buf. Roch. & Pitts. \* Sep 13; guard rails. McNicol, cor., ed. \* Oct 4, 4-**90**; St. R., Holland \* Mar 7; Cleveland rerailing guard \* Apr 11-**91**; Dutch St. R., Post *R & Eng* \* Apr; the Tilden \* Sep -**91**; Sav. Fla. & W. standard *R Gaz* \* Jan 17; and rerailer, Plant system \* 31-**90**; location of guard rail \* Feb 6-**91**

LEGISLATION *E Rec* Jan 16, 23-**92**

LOAD diag. for stresses in asimont *E News* \* Mar 10-**88**; panel concentrations due to engine loads. Szlapka, cor. Dec 6-**90**

RERAILER, Locke's protector *E News* \* Dec 27-**90**; Cleveland rerailing guard \* Apr 11-**91**; Post's *R Gaz* \* Mar 13-**91**. See also BRIDGES, railroad, guards

STRAINS, produced by loaded cars of 90,000 lbs. capacity. Blakely cor. and ed. *E News* May 10-**90**. See also BRIDGES, strains and stresses

TIMBER structures, western Am. *Eng* \* Sep 23, Howe truss 180 and 250-ft. span, inset \* Oct 7-**92**

RAO Shri Pragmalji, Mandvi, Kutch. Sykes *Inst C E* v 103-**91**

RED river concrete piers, Purdon *E News* \* June 2-**88**

RED Rock cantilever, Col. river, At. & Pac. R., foundations *E News* \* Sep 27; Waddell, inset detail sheet \* Oct 4, 4, correction, 11-**90**; Rowe *E Rec* Dec 19, 26-**91**, erection \* May 7 \* July 2-**92**, *Am C E*; abs. *Inst C E* v 103-**91**

RIPARIA, Snake river, Wash. T. *Eng* \* Nov 6, *Sc Am Sup* \* Dec 19-**91**

- Bridges**, RIVERMONT, Lynchburg, Va. *E News* \* Feb 21 **91**  
 ROCHESTER, N.Y., Driving Park ave., Genesee river *E Rec* \*  
 July 18 \* Aug 1, *R Gaz* \* July 17-**91**  
 ROCKFORD, Ill., State st. plate girder highway, inset *E News* \*  
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 ROPE and military applics., Gisclard *Sc Am Sup* \* Oct 17-**91**,  
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 RULO, report, Morison, bk. review *R & Eng* Feb -**91**  
 ST. Guistina viaduct, So. Tyrol, inset *E News* \* Feb 1, 1-**90**  
 ST. JOHN cantilever *E Rec* \* Mar 16, 30-**89**  
 ST. LAWRENCE river, Lachine, Can. Pac R., inset *Eng* \* Apr 13  
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 ST. Louis, Mo., Merchant's, Miss. river, inset *Eng* \* May 15,  
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 -**89**; Grand ave., inset \* July 18-**91**; Maline Creek \* Feb 20  
 -**92**; Grand ave (suspension) *E Rec* \* June 6, 20, 27 \* July 4 \*  
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 ST. Mary's Falls, Sault Ste. Marie, wind strains on, diags. *E*  
*News* \* May 25-**89**; Massy \* Oct 18-**90**; canal and dam *E*  
*Rec* \* Mar 22-**90**  
 ST. Paul, Minn., Miss. river high br. *E Rec* \* Feb 16, 23, Mar 2  
 \* Apr 6 \* May 11 \* July 20, erection \* Dec 21, 28; Col. st. skew  
 arch \* Nov 23-**89**; Wabasha st., erection \* Dec 26-**91** \* Jan  
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 ST. Peters, Dadore river *E Rec* Aug 10-**89**  
 SIBLEY, Missouri river, Chic. S. F. & Cal. R., Chanute, discuss.,  
 insets (full), construction, Wallace, superstructure, Breithaupt  
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**88**, abs. *Inst C E* v 99 -**90**, (dates) n *R Gaz* Feb 17-**88**  
 SIEE Ho, China R. *The Eng* Feb 3-**88**  
 SIOUX City, Monson report, pph. *R & Eng* \* May -**91**, *R Gaz*  
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 SKEW portals *E News* Apr 27, Leschorn, cor. \* May 18-**89**  
 SKIPTON & Ilkley, England *The Eng* June 15, 15-**88**  
 SOULEUVRE viaduct, France, Vire, St. Lo. & Caen R., piers  
*E News* \* June 28-**90**, *E Rec* \* Jan 10, 17-**91**, *Genie Civil*,  
*R & Eng* \* Mar, *Sc Am Sup* \* Apr 5, *The Eng* \* Jan 24-**90**  
 SMITHVILLE, Mo., Chic. Kan. C. & Tex. R., inset *E News* \* Jan  
 24-**91**  
 STAGING for girders bridges *The Eng* June 1-**88**  
 STARRUCCA viaduct, N.Y. L. Erie & W. R. *E News* \* Sep 1-**88**

**Bridges**, STEEL compression members. strength. expts., Dagron  
*R Gaz* Jan 6-**88**, *Am C E* -**87**

STEBENVILLE. P. C. & St. L. R., temporary support. renewing  
pier *E News* \* July 12-**90**

STOCKTON-on-Tees. Victoria br., Neate *E News* \* Sep 8-**92**,  
*Inst C E*

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STRAINS and stresses. Booth *Am C E* v 20 -**89**; greatest truss  
stress and position of load. etc., Eddy. inset (very full) \* v 22  
-**90**; slide moment diag. for computing, Greiner *E News* Apr  
14; web stresses with curved chords, Lindenberg. cor. \* 21  
-**88**; safe stresses in, Ottewell. diag. \* Feb 23; allowable  
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Howe, Jan 11; mechan. comput. of stresses, Fletcher \* Mar 1,  
May 10, do. Webb. cor. \* Apr 12; strains produced by loaded  
cars of 90,000 lbs. capacity, Blakely, cor. and ed. May 10;  
method of cal. strains in Whipple truss, W. Baldwin (math.) \*  
Aug 30-**90**; computing strains, German practice, Waddell  
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tures, Hiroi *R & Eng* \* Oct -**88**

STREET'S Run viaduct. Pitts. Vir. & Charleston R. *E Rec* \* Mar  
26-**92**

SUBAQUEOUS viaduct *E News* \* Feb 28-**91**

SUKKUR cantilever. Indus river, Parsey, inset *Eng* \* Mar 9, 9-**88**,  
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downe, Robertson, insets *Inst C E* \* v 103-**91**, do. *The Eng*  
\* Jan 9-**91**

SUSPENSION. and flume for lumber transport. Cal. *E News* \* Apr  
11-**91**; proposed new system, Steiner. cor. \* Mar 12-**92**.  
See also under Bridges. names.

SUSQUEHANNA river. Phil., Harrisb. & Pitts. R. *R Gaz* \* Feb 12  
-**91**

SWISS No. Eastern standard plate girder *E News* \* Mar 26-**92**,  
TARANTE, Italy, n *Sc Am Sup* \* Jan 14-**88**

TAVISTOCK & Shillamill viaducts, Plymouth & S. W. Junction  
R., England *The Eng* \* June 6-**90**

TAY viaduct, Dundee, Barlow *Eng* May 18-**88**, discuss., insets  
*Inst C E* \* v 94 -**88**, construction, Inglis *R Gaz* June 29-**88**

TESTING. Nansouty, Cuenot, abs. *Inst C E* v 108 -**92**, *Genie  
Civil* \* v 19 -**91**, *An Ponts* July -**91**

- Bridges**, THAMES river, New London, Ct., N. Y. Prov. & Boston R., inset *Eng* \* Apr 10 \* May 8, 15-**91** ; *E News* May 19-**88** ; *E Rec* \* Oct 11, 18-**90** ; *R & Eng* \* June -**88**, Nov -**89**, report, Nov -**90** ; draw-br. pivot pier *R Gaz* \* Nov 7-**90** ; lower single span, opening, proposed *The Eng* \* Mar 18-**92**. See also BRIDGES, draw-bridges
- TIDE-water Pipe Co. suspen.. Mauch Chunk, Pa. *E News* \* Feb 25-**88**
- TIMBER rolling-br., in Drowtheim. Cauer, abs. *Inst C E* v 92 -**88**, *Zeit Bauwesen* -**87**
- TORKHAM, India, launching of, Ollenbach *The Eng* Jan 13-**88**, *Ind Engr*
- TOWER, London, inset *Eng* \* Sep 23-**92** ; *E News* \* July 6-**89** ; *E Rec* May 21-**92**, *R & Eng* \* Oct -**90** \* Oct -**92**, \* *Industries* ; *The Eng* \* Aug 16, 30, 30, Sep 6, 6 \* Oct 18, 18 \* Nov 8, 8, 15 \* Dec 20, 20-**89** \* Apr 17-**91**
- TRANSANDINE, inset *Eng* \* Dec 2-**92**
- TRANSFER. Harsinn's Cove, Jersey City, Bensel, discuss., insets *Am C E* \* v 19 -**88**
- TRESTLES. See TRESTLES.
- TRUSSES, formulas for wt. of, Du Bois *Am C E* \* v 18-**88** ; abs. do. *Inst C E* v 96-**89** ; failures in 1889 and for 11 years, ed. *E News* Apr 19, 19 ; arch, Gilman, Aug 16-**90** ; truss deflection, J. Johnson *R Gaz* Aug 1-**90**
- TURIN, Po river, Margherita, abs. *Inst C E* v 92 -**88**, *Giornale Civ* -**87**
- TWO Medicine, Great No. R., St. Paul, Minn. & Manitoba R *E News* \* Mar 19-**92**
- TWYFORD viaduct, Didcot, Newbury & Southampton R. *The Eng* \* Dec 18, 25-**91**
- VAN Buren, Ark. river. construction, Purdon, discuss., insets (full) *Am C E* \* v 20 -**89**, piers erection, do *E Rec* \* Jan 11-**90**
- VANDEVANDA, Penn. R. *E News* \* Jan 12-**89**
- VERRUGAS viaduct, Oroya R., Peru, inset *Eng* \* Apr 17 ; *Olcott E & Min* \* Jan 24-**91** ; *E News* \* July 27-**89** \* May 9-**91**
- VIAUR, Du.. viaduct Carmaux & Rodez R., proposed, inset *E News* \* Nov 30, 30 *R & Eng* \* Nov, *Genie Civil* ; *The Eng* \* Dec 27-**89**
- VICTORIA, Stockton-on-Tees, Neate, inset *Inst C E* \* v 109 -**92** ; Kilmarnock *The Eng* Aug 30-**89**
- VIENNA, Stephanie, Danube canal, abs. *Inst C E* \* v 92 -**88**, *All Bauz* -**87**

**Bridges**, WASHINGTON, Harlem river, 181st st., N. Y. city, W. Hutton (bk.) *E & Min* \* Sep 27-90; designs, inset *E News* \* Dec 27-90; (Manhattan bridge) Hutton, bk. n *E Rec* Jan 31-91

WEEHAWKEN viaduct and pass. elevators, T. Brown, Blakeley, insets *Am C E* \* v 27-92, inset *R Gaz* \* Jan 22-92

WEIGHTS of, DuBois, inset *Am C E* \* v 18-88; formulas, Moss-crop *E News* Mar 17-88

WHARFE river, Yorkshire *The Eng* May 25-88

WHITE'S plate girder, Del. Lack. & W. *R & Eng* \* July -91

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- Brooklyn**, navy yard *Eng* Oct 17-**90**. See also BRIDGES — RAILROADS, Brooklyn, etc.
- Brooks**, David, por. *El Wld* \* June 6, *F Inst* July -**91**
- Brown**, C. E. L., por. *El Wld* \* Oct 17-**91**
- Brown**, John *Inst C E* v 95 -**89**
- Brown**, Samuel *Inst C E* v 109 -**92**
- Brown**, Thomas *Inst C E* v 92 -**88**
- Brown**, William A. *Inst C E* v 95 -**89**
- Brush**, Charles F., por. *El Rev* \* Aug 2, *Harpers W* July 26-**90**
- Buarque**, Antonio L. *Inst C E* v 100 -**90**
- Buchholz**, John A. A. *Inst C E* v 101 -**90**
- Buddicom**, William B. *Inst C E* v 91 -**88**
- Buell**, Madison, por. *El Eng* \* Aug 19-**91**
- Buenos Ayres**, gas supply, Stevenson *Inst C E* v 103 -**91**
- Buffalo**, N. Y., map *Eng* \* Nov 30-**88**, *El Rev* \* Feb 20-**92**
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- AGRICULTURE, World's exhib., Chic. *Eng* \* Apr 29, \* May 6-**92**
- ALLEGHENY County Courthouse *E Rec* \* Nov 10-**88**
- ANCHORING of, Goetz *Sc Am Sup* \* Dec 21-**89**
- ARCADE, Cleveland *E Rec* \* Mar 21, 28 \* Apr 4 -**91**
- ARMORY, O. N. G., Cincin. O. *E Rec* \* Dec 7, 21-**89**; 12th reg't, N. Y. \* Jan 7-**88**
- ASSOCIATIONS *Sc Am Sup* Dec 28-**89**
- AUDITORIUM. Chicago *Eng* \* Apr 3, 24-**91**, *E Rec* \* Apr 12, construction \* Nov 22, 29-**90**, \* Feb 21, \* Mar 7-**91**; *Locom* May -**90**
- BATHS, European public *E Rec* \* Apr 18, special bath-room \* Oct 3-**91**
- BEAM anchoring, Goetz-Mitchell sys., com. rep. *F Inst* \* Nov -**91**
- BOILER shop, Pitts. Locom. works *R Gaz* \* Feb 7-**90**
- BOSTON Chamber of Commerce *E Rec* \* May 7, 28, \* June 4; building law, Aug 6-**92**
- BRIGHTON beach hotel, Coney Is., moving *E News* Apr 7-**88**, *R Gaz* \* Apr 6-**88**

- Buildings**, CHICAGO, and foundations. Sooy Smith, and ed. (full) *E News* Oct 13-92; fire-proof construc. *E Rec* \* Feb 16-89; tall, construction on compressible soil, Jenney \* Nov 14; the McVickers \* June 13; Rand & McNally, construction \* Dec 12-91, \* Jan 9, 30 \* Feb 13-92. See also BUILDINGS, Auditorium, etc.
- CHURCH, Buffalo, large wooden dome *E News* \* June 28-90; roof truss, St. Paul *E Rec* \* Oct 27-88; spire framing and anchoring \* Jan 12-89; steeple, Asservent church \* Dec 20-90
- CITY Hall, Kansas C., Mo. *E Rec* \* Apr 2, 16-92; the city hall in Am., Ferree, insets *E Mag* \* Nov -92
- CLEANING, outside *E Rec* Feb 20-90
- CLUB house, Down Town Assoc., N. Y., inset *E Rec* \* Dec 10-87; Freundshaft, N.Y. \* Dec 15-88
- COLUMBIAN exhib., Freitag *E Mag* \* Nov -91; foundations and floors, Gottlieb *J Assoc E Soc's* Dec -91. See also BUILDINGS, U. S. Gov't and under names; EXHIBITIONS, U. S. Columbian
- COLUMNS, strength, formulas, Johnson *E News* Dec 22-88. See also COLUMNS
- CONSTRUCTION, (safe) and slow burning, Woodbury *Eng* Apr 10-91; notes, bk. review, May 6-92; fall of Park Place, Atkinson *E Mag* \* Nov -91; fire-proof interior, Carrere \* Oct -92; anchoring beams, Goetz-Mitchell system *E News* Nov 21-91; errors in, D'Oevich *E Rec* May 12-88; fire-proof, Chic. \* Feb 16-89. See also BUILDINGS, high
- CONTRACT, standard, com. rep. *E Rec* Sep 15-88; contractor's eng. and plant, files -88-92
- COURT house, Allegheny Co. *E Rec* \* Nov 10-88; Custom house, National, Bell, Dec 3-87
- DOME, Buffalo church, large wooden *E News* \* June 28-90
- DREXEL office, Phil. *Eng* \* Nov 15-89, *E Rec* \* May 4-25-89
- EARTHQUAKE countries, building in, Milne *E News* Jan 10-91, *Inst C E* v 100 -90
- EDGEWOOD Bridge works shops *E Rec* \* Apr 19, 26 \* May 3-90
- EFFLORESCENCE and impervious mortar, Baker *E News* Apr 7-88
- ELECTRIC, World's Columbian exhib. *Eng* \* Dec 16 \* 30-92. See also EXHIBITIONS, U.S.
- FERRY house Barclay st., N.Y. *E Rec* \* Nov 24-88

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FLOORS. See BUILDINGS, fire-proof floors

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- MACHINERY Hall, Paris exhib. *E Rec* \* Aug 24 \* Sep 7, 21, 28 \*  
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- MANUFACTURES, World's Columb. exhib., inset *E News* \* Sep 1  
-**92**. See also EXHIBITIONS, U. S. Columbian
- MARKET Hall, La Plata, Ende *The Eng* \* Nov 28-**90**
- MASONIC Temple, Chic. *Eng* \* Aug 7-**91**
- MATERIALS, market, '89 *E & Min* Jan 4-**90**; Nylolith (wood-  
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abs. *Inst C E* v 97-**89**, *Woch Ost Ing* -**89**. See also BRICK;  
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PLASTER; STONES; TIMBER; WOOD, etc.
- MAUSOLEUM, or campo santo, N.Y., (full) *Sc Am Sup* \* Jan 4-  
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- METROPOLITAN opera house, N. Y., construction *E Rec* \* June  
13; St. Paul, Minn. \* July 11 -**91**
- MILL, construction details, Hutchinson, inset (full) *E News* \*  
Nov 10-**92**. See also MILLS
- MONMOUTH Park Assoc., N. J., grand stand *E News* \* Jan 18,  
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- MOVING, Brighton beach hotel, Coney Is., N. Y. *Sc Am Arch*  
*edition* \* May -**88**, *The Eng* Apr 27, 27-**88**, masonry, and  
raising *The Eng* \* Dec 30-**92**
- MUSEUM, and arrangement, Ferree *E Mag* \* Nov -**91**
- N. Y. Music Hall *E Rec* \* July 4-**91**; N. Y. World (Pulitzer)  
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- ORCHARD house *Sc Am Sup* \* May 19-**88**
- PALACE of Chapultepec, Mex., grand stairway *E News* \* May  
11-**89**
- PARIS Post Office *Sc Am Sup* \* Aug 25-**88**
- PAVILION, Coney Is. *E Rec* \* Nov 9-**89**
- PHOENIX girder shop, Pa., framing *E Rec* \* Apr 7-**88**
- PRISONS, French *E Rec* \* Oct 6-**88**; Lack. Cty. \* Nov 30-**89**

- Buildings**, Ponce de Leon hotel, Fla., concrete construction  
*E News* \* Mar 16-**89**
- PORTABLE. Ducker's *Eng* \* Feb 3-**88**; hospital or barracks  
*Sc Am Sup* \* Jan 14-**88**
- PROTECTION, electric, against water overflows, Weil *F Inst* Oct  
 -**88**. See also FIRE protection
- REPAIRS and restoration, hints to workmen *E Rec* Nov 19-**92**
- RIDING School, 75th st. N. Y., elevated ring *E Rec* \* June 16-**88**
- ROOF water removal, Porter *E Rec* May 4-**89**, *Tech Q* \* Feb  
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- ROOKERY, Chicago *E Rec* \* Nov 3-**88**
- St. Augustine, Fla., concrete construction, Ponce de Leon, etc.  
*E News* \* Mar 16-**89**
- St. Mark's, Venice, Scott *Sc Am Sup* Jan 7-**88**
- SKYLIGHT, dome, No. West Life Ins., Mil. *E Rec* \* July 6-**89**
- SORBONNE, Paris *Sc Am Sup* \* Sep 7-**89**
- STEEL works, Homestead, Press shops *E News* \* Nov 10-**92**
- STONES, and decorative, of Egypt *E & Min* Feb 25-**88**; British,  
 crushing strength, Beare (full) *E News* \* Sep 22-**92**, do. inset  
*Inst C E* \* v 107 -**92**; N.Y., report *Sc Am Sup* Dec 31-**92**.  
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- STOREHOUSE construction, standard, Woodbury *E & Min* Apr  
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- SUBURBAN summer communities, Wingate *E Mag* \* Sep -**92**
- THEATRES construction and arrangement, Hexamer *F Inst* July  
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- TRANSPORTATION, World's Columb. exhib. *Eng* \* Dec 2, 9-**92**;  
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- U. S. Gov't, World's Columb. exhib., Chic., ironwork for dome,  
 McGuire, insets *Am C E* \* v 26 -**92**. See also BUILDINGS,  
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- WATER closet, London public *E Rec* \* Mar 19-**92**
- WORLD's Columbian exhib., U. S. See BUILDINGS, names;  
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- Bullet** probe, telephonic, Girdner *Sc Am Sup* \* Mar 3-**88**
- Bullmore**, Frederick C. *Inst C E* v 92 -**88**
- Bullock**, Milan C., por. *E & Min* July 25-**91**
- Burglar's** kit *Sc Am Sup* \* Oct 4-**90**

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**Burnham**, N. F. (turbine inv.), por. *Sc Am Sup* \* Mar 28-91

**Burrell**, Percy *Inst C E* v 103 -91

**Butter**, composition, Vieth *Sc Am Sup* Mar 14-91; extractor *The Eng* \* June 28-89

**Buttle** bodies nature. Kick, abs. *Inst C E* v 100 -90, \* *Tech Blatter* -89

**Butts**, Elijah P. *Am C E* v 26-92

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- Cable** Railroads, BIRMINGHAM, England, st., ed. *Eng* Mar 30, *Sc Am* Nov 3, *The Eng* June 22, 29, Sep 28, 28-**88**
- BROOKLYN bridge, N. Y., Leverich, insets *Am C E* \* v 18-**88**, inset *Eng* \* Oct 5 \* 26, Nov 9, 16, 30-**88**, abs. *Inst C E* v 95-**89**; terminals, com. report and ed. *R Gaz* \* Apr 27-**88**, (full) *St R J* \* July, grip \* Dec -**90**
- CALIFORNIA, in, Van Vleck *Eng* \* Jan 9-**91**. See also CABLE R., Oakland, San Diego
- CHICAGO, No. & Western *St R J* \* May -**90**
- CLEVELAND City *St R J* \* June -**91**
- CROIX-ROUSSE, Lyons *The Eng* Dec 7-**88**
- EDINBURGH No. Tramways *E News* \* July 20-**89**, Colam (full) *St R J* \* Jan -**91**, *The Eng* \* Aug 8, 8-**90**
- FRENCH R & *Eng* \* Jan -**89**, *Genie Civil*. See also CABLE R., Havre
- GREAT Britain, and electric, McCallum *St R J* Oct -**92**
- HAVRE, Foris, abs. *Inst C E* v 106 -**91**, *Genie Civil* \* v 19 -**91**
- HECKERT system *St R J* \* Aug -**88**
- KANSAS City *E News* Dec 8-**88**; traction, effc. diag. \* May 3 -**90**; *St R J* \* Jan -**88** \* Feb -**90**
- LIGHT road construction, Van Vleck *Am M E* \* v 11 -**91**, *E News* \* Nov 22, roads \* 29 *St R J* \* Dec -**90**
- LONDON, England, electric and *El Rev Lond* Sep 16-**92**
- LOS Angeles, Cal. *Eng* \* Aug 28-**91**; cable viaduct *E News* \* Jan 25-**90**; Nov 7-**91**; single-post viaduct, Hawgood, Temple st., Wood, inset *Inst C E* \* v 107 -**92**; *Sc Am Sup* \* Oct 10-**91**; *St R J* \* Mar, Temple st. Co. \* Sep -**90**
- MELBOURNE, Australia *St R J* \* Feb -**90**
- MT. S. Salvatore, near Lugano, Switz., Strub, abs. *Inst C E* v 110 -**92**, \* *Schweiz Bauz* -**92**
- MT. Vesuvius, Zanetti, n *St R J* \* Mar -**91**
- MULLER traction system *St R J* \* Dec -**92**
- NEW York city, Broadway, building, Iles, insets *E Mag* \* Dec -**92**; 3d ave., track details, inset *E News* \* Dec 13, pulleys and lifts \* 20-**90**, Broadway, insets \* Aug 22-**91**, do. *E Rec* \* July 25 \* Aug 15 \* Nov 7, 14-**91** \* Sep 3 \* Oct 1, do. *R Gaz* \* Sep 2-**92**; 3d ave. *St R J* \* Nov -**90**, construction \* June, Broadway work \* Aug, 3d ave. construction \* Sep -**91**
- OAKLAND, Cal., novel *St R J* \* Dec -**90**
- OTIS elevating R., Catskill mts. incline, inset *E News* \* Aug 18 \* Sep 8, *R Gaz* \* Aug 12, 26-**92**

- Cable** Railroads, PARIS, the Belleville *Sc Am Sup* \* Sep 6-**90**, *Genie Civil*
- PHILADELPHIA Traction Co., conduit, Wagner *F Inst* \* Feb -**88**
- ST. Louis, inclined, for frt. car transfer *R Gaz* May 20-**92**; plant *St R J* \* June -**91**
- SAN Diego, Cal., Van Vleck *St R J* \* July -**91**
- SWISS, Strub *R Gaz* July 8-**92**, *Schweiz Bauz*
- TERRY system *St R J* \* May -**89**
- VOGEL system, conduit and grip *E News* \* Jan 31-**91**
- WASHINGTON & Georgetown R. power station *St R J* \* Dec **91** \* Sep -**92**
- WHITE'S, R. T., conduit *E News* \* June 20-**91**
- Cacao** (chocolate bean), Curtis *Sc Am Sup* Mar 15-**90**
- Caffeine**, action of (full) *Sc Am Sup* June 21-**90**. See LAPICQUE
- Calculating** machine, Felt's *Sc Am Sup* Oct 27-**88**. See also CENSUS tabulating, Hollerith machine
- Calculation**, mental, Bidder. Pole *Inst C E* v 103 -**91**, remarkable feat of, do. *E News* Sep 19-**91**; multiplication, quick method, Fuller, cor. Jan 30-**92**
- Calendar**, perpetual, McFarland's *Sc Am Sup* Apr 11-**91**; old style and new (reckoning) *Locom* Oct -**90**
- Calorimeters**, simple, Peabody *Am M E* v 10 -**89**; errors of different types, do., an universal, Barrus \* v 11, 11-**90**; notes, Carpenter \* v 12 -**91**; Barrus' universal *E News* \* May 31-**90**; new, Peabody *F Inst* \* Aug -**88**; for testing fuels on a small scale, Donkin *Inst C E* \* v 102 -**90**, do. *The Eng* \* Jan 9-**91**; Heisler throttling *Power* \* Feb -**91**; steam, for locom. use, ed. *R Gaz* Jan 22-**92**; Peabody *Tech Q* Oct -**88**, errors, expts., do. Feb -**90**
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- Camp** stove *E News* \* Nov 1-**90**
- Camphiers**, Gerrit W. *Inst C E* v 109 -**92**
- Cams** cutting, new proc., Gabriel *Am M E* \* v 13 -**92**, *Iron Age* \* Dec 8-**92**
- Canada**, Sudbury ore-deposits, Ont., Peters *Am Min* v 18 -**90**; reciprocity with, Wiman *E Mag* Oct, Dec -**92**; province of Manitoba *E News* Jan 5; eng. works, Keefer, 26; and U. S., pop. growth, 1790 to 1880, Apr 27; water-works of, ed. and drag, \* 27, 27, May 4-**89**; census, ed. Nov 14 **91**; notes, Nov

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3-92; mineral resources, ed. *The Eng* Jan 2-91. See also MINES; QUEBEC; RAILROADS, Can. Pac., etc.

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CASCADES, locks *E Rev* \* Oct 8, 15-92

**Canals, CHICAGO drainage** *E News* \* June 2, 30-**92**

CORINTH ship, St Yves, Greece *E News* \* Jan 17-**91**, abs. *Inst C E* v 96-**89** \* *An Ponts* v 16-**88**; *R & Eng* Sep -**90**; *Sc Am Sup* July 14-**88**

DOLORES, Col., head gates and boom, inset *E News* \* Jan 4-**90**

EMS-Jade, Kurs. abs. *Inst C E* v 92-**88**, *Deut Bauz* -**87**

FINLAND, roads and railroads, Strukel, abs. *Inst C E* v 99 -**90**, *Allgem Bauz* -**89**

FORTH & Clyde ship, Scot., proposed *Eng* Feb 14, Crawford, Aug 29-**90**; *E News* Dec 14-**89**, Apr 25-**91**

FRANCE, cost of motive power on, *E News* June 14-**90**; river and other works, Vernon-Harcourt, discuss., insets (full) *Inst C E* \* v 96 -**89**; internal nav. in *R & Eng* Jan -**90**. See also CANALS, Havre

GANGES, lower, failure of Kali Nadi aqueduct, Thelnall, abs. *Inst C E* v 95 -**89**, construction, Good, inset \* v 105 -**91**

GERMANY, Belgium, France, river and other works, Vernon-Harcourt, discuss., insets (full) *Inst C E* \* v 96 -**89**

GREAT Britain, Soc. of Arts conference *R Gaz* July 27-**88**; inland nav., Clements *The Eng* Aug 15, 22-**90**

GREAT Western ship, England, proposed, map *Eng* \* Oct 12-**88**

HAGUE, renewal of water in, Pichler, abs. *Inst C E* v 95 -**89**, *Woch Ost Ing* -**88**

HAVRE to Tancarville, Widmer, abs. *Inst C E* v 110 -**92**, *An Ponts* May -**92**; *Sc Am Sup* \* Sep 15-**88**, *La Nature*

HUDSON river ship and great lakes, North *E News* May 5, *Forum* May -**92**. See also CANALS, Lakes

INDIA, ed. *Eng* Oct 14-**92**

JURAPA irrig., Finkle *E News* \* May 17-**90**

KIOTO & Lake Biwa, Japan *Eng* \* Jan 25-**89**

LAKES, Erie & Ohio river ship, proposed *E News* \* Mar 21, do. *R Gaz* Apr 10-**91**; Great lakes & Atlantic seaboard enlarged waterway, Corthell *Eng* July 17, 24, do. *E News* Apr 18 \* 25, do. (very full) *Sc Am Sup* July 4-**91**, *J Assoc E Soc's*; Superior & Mich., proposed, maps *E News* \* Mar 22-**90**

LIFTS, hydr., Prussman's *Eng* \* Oct 14-**92**; lifts on, Harcourt *E News* Aug 4-**88**; hydr., Belgium *R & Eng* \* Mar -**89**, *Genie Civil*

FONTINETTES, France, hydr. *E & Min* \* Sep 29-**88**, \* *Industries*, vertical, Hoppe system, Petri *E News* \* May 9, 23 -**91**, *E Rec* \* June 23 *R Gaz* \* Sep 28, *Sc Am Sup* \* Sep 29 -**88**, *The Eng* \* Dec 21-**88** \* Jan 11, 25 \* Feb 15-**89**

Canals, Lifts, LA Louviere, Belgium, hydr. *Eng* \* Oct 12. *The Eng* Dec 21, 21-**88** \* Jan 25, 25-**89**

LIVERPOOL & Birm. See CANALS, Birmingham

LOCKS, accident. Sault Ste Marie *E & Min* \* Aug 30-**90**; of 20 metres (65 ft.) lift, Fontaine's *E News* \* Sep 19-**91**; Cascades *E Rec* \* Oct 8, 15; gates, distrib. of beams in. Stoney *The Eng* \* Apr 1; adjustable and weir, Hale, cor. \* May 6-**92**

MANCHESTER ship, ed. *Eng* June 8, 15, 29, July 20, Sep 7, 21, Oct 5, ed. Dec 21, 28-**88**, Apr 25, Wins \* Aug 29 \* Dec 5-**90** \* Jan 16 \* Feb 13, 27 \* Mar 13, 27 \* Sep 11 \* Oct 2, ed. Dec 4-**91**

*E Mag* Dunell \* Nov. Dec -**91**; and Corinth *E News* June 30, July 28, Aug 4 \* Sep 29-**88**, profile \* Jan 11-**90**; *E Rec* \* Sep 29 \* Nov 17, Dec 8, 15-**88**, Feb 16 \* June 8, 15, July 27 \* Sep 7 \* Oct 5, 26-**89**; mechan. appliances. Wins, insets *Inst M E* \* July -**91**; Harrison *Locom* Dec -**89**; *R & Eng* \* Oct -**90**; *R Gaz* Sep 14-**88**, Hansel, map \* Aug 19-**92**; Wells *Sc Am Sup* Feb 16-**89**, map \* Aug 16-**90**

*The Eng* Wells. Sep 21, and Barton aqueduct. Nov 2-**88**; \* May 24-**89** \* Jan 31, map \* July 11 \* Aug 22 \* Oct 10, Nov 14-**90**, Weaver river sluices \* Jan 9 \* Mar 6, 13 \* July 17, 24 \* Aug 21 \* Oct 2 \* Nov 6, 27-**91**, prog. \* May 13 \* Aug 12, 19, Sep 16 \* Nov 18-**92**

MARNE & Saone, Florentin. abs. *Inst C E* v 105 -**91**, *An Trav Pub* -**91**

MERCED irrig *E News* Feb 4-**88**

MICHIGAN & Superior lakes, proposed, maps *E News* \* Mar 22-**90**

NEW York, state imp. *E News* Aug 18-**92**; & Phila. ship (Del. & Raritan rivers), proposed. Haupt, inset *F Inst* \* Mar -**92**

NICARAGUA ship *Eng* Menocal \* Aug 22, Dec 26-**90**

*E & Min* maps (full) \* May 4-**89**

*E News* surveys. June 16, ed. n 30, Menocal \* July 7, 14 ed. 14, Peary, Aug 18, 18-**88**, map and inset \* Sep 14, 14-**89**, proposed guarantee, ed. Feb 7, notes \* May 30, \* June 6, ed. 6, 13, 20, 27-**91**; engineer's report and ed. Dec 15, 15-**92**; *E Rec* May 23-**91**

*F Inst* and Panama, notes. Oct -**88**, Taylor, Jan, profile \* Feb, Am. Isthmian routes, Ammen, Dec -**89**; Davis, inset (full) \* July, Aug -**92**; Diebitsch *Lehigh Eng* Feb -**89**

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*Forum* Miller, Merry, Feb -92; *R Gaz* Aug 29-90

*Sc Am Sup* (full) \* Feb 2, 16, 16 \* Mar 2-89, Peary, Jan 11, 18-90

*The Eng* Feb 17-88, \* June 12 \* July 3, Aug 14, Nov 6, 27-91  
NORTH Sea, Amsterdam. Huet, abs. *Inst C E* v 99 -90, \* *Tijd Konin Ing* -88-89. See also CANALS, Baltic

PANAMA interoceanic ship, plant and material, Williams, insets (full) *Am C E* \* v 19 -88; Isthmus canal and our Gov't. *Atlan M* Mar -89

*Eng* Rogers Apr 20, June 8, ed. Dec 21-88 \* Jan 11, locks, inset \* Nov 1-89, directors, ed. Nov 25-92

*E News* locks, proposed \* Feb 11 \* Mar 10, actual status, profiles, ed. etc. \* June 2, 2, water supply 16, what the Slaven dredges are doing, Appleton, cor. 16, actual status, Snow, great Culebra cut, ed. \* 16, 16, recent trip over, Lockett, 23, and Nicar., ed. July 14, prog., cor. 28; Aug 11, de Lessep's report, ed. 18; plant and machinery, Williams \* 18 \* 25; financial status, ed. Dec 8-88; cost, etc. Oct 19-89

*E Rec* Rogers (full) \* Jan 28-88; McAlpine's opinion, Feb 22-90; completion, report, May 30-91; *The Eng*; works, Nansouty, abs. *Inst C E* v 92 -88, \* *Genie Civil* v 12 -88; (cost) *R & Eng* Feb \* June -91; new, Crowell, cor. *R Gaz* Oct 28-92

*Sc Am Sup* work on \* Mar 10, locks \* 31, \* July 21 \* 28 -88, \* May 25, Wins (very full) \* June 1, 8, 15-89, projects for completion, Malgarini's \* Nov 12-92

PECOS Valley, New Mexico *E News* \* Oct 17-91

PENN., L. Erie & Ohio river, proposed *E News* \* Mar 21, do. *R Gaz* Apr 10-91. See also CANALS, Lakes

QUEBEC-Montreal ship channel *Sc Am* Mar 16-89, *Eng*

RICHMOND, Va., eng. problem at, Adams *Am M E* \* v 12 -91

SAULT Ste. Marie, ed. *Eng* Sep 14-88, Sep 5-90; *E News* Jan 4, traffic for nine seasons, Mar 1-90; lock accident *R & Eng* \* Oct -90; and Suez, traffic *R Gaz* Apr 17-91; *Sc Am Sup* Oct 20-88

SIBERIA, new waterway, abs. *Inst C E* v 92 -88, *Osterreich Ing* -88; Mas *R & Eng* Sep -89, *An Ponts*

SIDHNAI system, MacLean, abs. *Inst C E* v 103 -91

SPAIN, inland nav., abs. *Inst C E* v 104 -91, *An Construct* Madrid -90

**Canals**, SOUTH Yorkshire junction, proposed *The Eng* \* Oct 17-**90**

SUEZ, traffic growth *E & Min* Apr 20-**89** ; ships passed through *E News* Apr 28, June 9-**88**, report, July 6-**89**, traffic diagram \* July 11-**91** ; and Sault Ste. Marie traffic *R Gaz* Apr 17-**91** ; lighting of *The Eng* \* Dec 6-**89**

SUPERIOR & Mich. lakes, proposed, maps *E News* \* Mar 22-**90**

WASTE weir, aut., Foote, inset *Am C E* \* v 18 -**88**

**Canes** and sticks manuf., Jackson *Sc Am Sup* May 11-**89** ; cane contrivances \* Nov 26-**92**

**Canning** fruit *Sc Am Sup* Jan 4-**90**

**Capital** and labor, the rights of *Blackwood's Mag* Dec -**91** ; conflicts, Howell, bk. review *Eng* Aug 29-**90** ; the remuneration of, ed. Dec 11-**91** ; does capital need high-priced labor, Partridge *E Mag* Aug -**92** ; how to secure harmony between, Hewitt *E & Min* Oct 11-**90**, *Am Min* ; the consumer, Rice *Forum* July -**92** ; are business profits too large, Mann *Pop Sci* Nov -**92**. See also LABOR ; MANUF. industries net profits

PROFIT-sharing, co-operation, B. Jones *Eng* Sep 19-**90** ; industrialism, Esson *El Rev Lond* Nov 7, 14-**90** ; gain-sharing Towne *Am M E* v 11 -**89** ; profit sharing enterprises, ed. *Eng* Feb 13, ed. July 31-**91**, Gilman *Soc Arts Mass* -**89**

**Carbon**, bisulphide manuf. and purification, Singer (full) *Sc Am Sup* \* Apr 20-**89** ; funnel, for filtering, Drown *Tech Q* May -**88** ; heat of combustion, Berthelot *R Gaz* July 26-**89**, *Compt r*

**Carbonic** acid liquid manufacture *Sc Am Sup* \* June 27-**91**

**Carborundum**, Guy *Sc Am Sup* July 16-**92**

**Carnegie**, Andrew, por. *E & Min* \* July 4-**91**

**Carpenter**, R. C., por. *Cassier's* \* Jan -**92**

**Carpet** beating machines *Sc Am Sup* \* Apr 21-**88** ; industry. Phil. Apr 13-**89** ; weaving, Persian, Vries, Aug 29-**91**, *J Soc Arts Lond*

**Carr**, Henry *Inst C E* v 95-**89**

**Carr**, Mark W. *Inst C E* v 93-**88**

**Carriages**, elastic traction, Lemoine's *Sc Am Sup* \* Oct 8-**92** ; torsion in, King *The Eng* \* Aug 28-**91**

**Carriek**, John *Inst C E* v 101 -**90**

**Cars** and carriages, Railroad, rolling stock, Paris exhib. *Eng* Aug 30-**89**, local R's, inset \* Apr 4 -**90** ; standards, good and bad *E News* June 9-**88**

**Cars, ACCOUNTANT'S Assoc. pro. *R Gaz* June 29-88**

AXLES, steel, Coffin *Am ME* \* v 9 -88; effect of temp. on strength, Andrews *E News* \* Feb 18, 18, 25-88, Nov 14-91, do. inset *Inst CE* \* v 94 -88, insets \* v 105 -91; and wheels, machine for rolling, Aitken's ap., pats. *R & Eng* \* Sep -90; wheels and track, discuss. *R Gaz* Feb 17: 60,000-lb. cars, standard, proposed \* June 8-88, do. Rhodes and ed. \* Feb 22, 22, Mar 1, discuss. 29, M. C. B. \* Oct 11: steel, tests, Pencoyd works, Nov 8-89

AXLE and journal-boxes, lubricating, cost, Randolph *Am ME* \* v 11 -90; stamped steel *Eng* \* June 20-90; Macnee's dust proof *E News* \* Dec 15-88 \* May 2-91; bearing for 60,000-lb. cars, M. C. B. Assoc. com. report \* June 14-90

*R Gaz* anti-friction metals, Bennett, Jan 18, 25; Erie journal-box \* Sep 20; and bearings, Adams, Nov 22-89; 60,000-lb. cars, proposed M. C. B. \* June 20-90 \* June 19-91; stamped steel \* July 18; standard, proposed \* Aug 22-90; the Timms *The Eng* Apr 13-88

BRAKE, Kane's *Sc Am* Feb 16-89. See also RAILROADS, brakes  
BRUNIG, Paris exhib. *Eng* \* Aug 23 -89

BUENOS Ayres & Ensenado Port, buffet smoking *The Eng* \* Feb 20-91

BUFFER, Westinghouse friction *R Gaz* \* Nov 2 \* Dec 21-88 \* Feb 21-90, *The Eng* \* Mar 14-90

BUILDER'S Assoc., Master, pro. *E News* June 23-88 \* June 13, 20-91, June 16 \* 23-92, reports *R & Eng* \* July -92, table, inset (full) *R Gaz* June 15 \* 22-88, June 28, July 5-89, June 13 \* 20-90, June 12, 19-91, June 17, inset \* 24-92

CALEDONIAN R., inset *Eng* \* Feb 21-90

CATTLE, So. R., France, wagon, Paris exhib., inset *Eng* \* Nov 8-89; the Canda *R Gaz* \* Mar 2-88

CHOCK, for stopping *E News* \* Aug 9-90

CLEARANCE in width required by *R Gaz* \* Nov 9-88

COAL, Chic. Rock Is. & Pac. standard, inset *E News* \* Aug 11 -92; Tex. & Pac. *R & Eng* \* Nov -91; standard \* Apr \* May -92

COUPLERS, standard, dimens. *E News* \* Jan 28-88; contour lines, etc., Barnes \* Jan 3-91; breakages, service record and ed. \* Feb 15, 15-90 \* May 12-92; and brake legislation *R & Eng* Mar, May -92; vertical plane, in service, ed. *R Gaz* Jan 17; frt., C. B. & Q., broken \* June 6-90; vertical plane,

## Car COUPLERS

- Barnes, and aut. air brakes \* Jan 2, Feb 6, ed. 6; what constitutes a defect in ver. plane, discuss. 23, mixed unlocking gear disadvantages \* Nov 13-**91**; strength, Forsyth, Mar 4, 11-**92**
- BLACKSTONE's platform and *R Gaz* \* July 15-**92**
- BUHOUP'S *E News* \* August 25-**92**
- CHICAGO, the *R Gaz* \* Nov 14-**90**
- DREXEL *R Gaz* \* May 15-**91**
- EMPIRE *R & Eng* \* June -**92**
- FOX aut. vertical plane *R Gaz* \* June 20-**90**
- HINSON *E News* \* Aug 1-**91**
- HUSELTON aut. *R Gaz* \* Apr 11-**90**
- JANNEY frt., safety stop for *E News* \* Jan 2-**92**; *R Gaz* \* Feb 17-**88**, vs. Miller, ed. Apr 11, evolution of \* June 6, life of, diagrams of broken \* Nov 7-**90**, with Bentley's vestibule \* May 1 -**91** failures \* May 13-**92**
- KEYSTONE *E News* \* Nov 2, *R Gaz* \* Nov 8-**89**
- MASTER Car Builder's aut. *E News* introduction of, ed. Mar 28, R's equipped with, inset map \* Apr 25, 25 \* June 13, standard gauges for \* Sep 19-**91**, strength, Forsyth \* Mar 5-**92**
- R & Eng* form of contour lines, report \* May -**88**, standard gauges \* Oct -**91**, possibilities of, discuss., Eastwick (full) \* Apr, May -**92**
- R Gaz* \* Apr 20-**88**, at interchange points, ed. \* July 25 \* Aug 18, on curves \* Oct 3-**90**, broken knuckles \* Jan 2, cost, ed. May 15, report \* June 12, standard gauge \* Sep 18-**91**, M. C. B. Assoc. action, Apr 22, testing machine \* Sep 2-**92**
- ROBERT-Eastwick *R Gaz* \* June 6-**90**
- TESTING, method *R Gaz* \* Aug 19, testing machine \* Sep 2-**92**
- THURMOND frt. *R Gaz* \* June 5-**91**
- TROJAN *E News* \* Nov 29, *R Gaz* \* Dec 5-**90**
- UNION aut. *R Gaz* \* Jan 30-**91**
- VAN Dorston and buffer *R Gaz* \* Dec 14-**88**
- DERRICK, 15-ton, Penn. *R Gaz* \* Oct 18-**89**, 10-ton, Balt. & O. \* Jan 9-**91**
- DRAW-bars, height of M. C. B. com. report *E News* June 28-**90**; Graham's draft rigging, Penn. R., discuss. *R Gaz* \* Mar 29, 29; Cushing's stop \* Oct 25; Chic & N. W. \* Nov 1-**89**; Safford aut. \* Oct 17-**90**; Butler draft gear \* Apr 1; draft gears for frt. cars. Barnes \* June 3-**92**

- Cars**, DUMP, Can. Pac. *E News* \* July 21-**88**; rotating \* July 12-**90**; iron, No. R. of France *R & Eng* \* July-**88**; the Goodwin \* July -**89**; Thacher compressed air \* Dec -**92**, do. *R Gaz* \* Nov 11-**92**; George's Creek & Cumb. \* Jan 25-**89**; and gondolas. Goodwin, Jan 31; standard, B. & A. \* Mar 7-**90**
- FRANCE, experimental, West. R., Paris exhib. *Eng* \* Oct 4; local R's 2d class, Paris exhib. \* Nov 29; 1st class, So. R., inset \* Dec 13-**89**; State R \* July 4-**90**; pass. *R Gaz* \* May 15-**91**. See also CARS, dump—freight
- FREIGHT, Goodfellow & Cushman's *Eng* \* Dec 7-**88**; unloading by steam shovel *E News* \* Oct 5-**89**; construction imp., Barnes \* Jan 30; lubrication, cost. Dec 1-**92**
- R Gaz* relative cost of car load and less, Fink, Feb 3; depreciated values. table. Apr 27; ballast and plow, Roger's \* July 27-**88**; equity of per diem and mileage plan, Yardley, Wattson, cor. Mar 15, Apr 5; relative econ. of large and small capac., ed. Apr 26; springs, bolster, tests. Hazlehurst, diags. \* Oct 4-**89**; end platforms for, ed. Jan 10; housing for gondolas and stock \* Mar 28; ventil., Pancoast's system \* Apr 11; mileage decrease on home roads, Wattson, July 11; handling and distrib. on West Shore Oct 10-**90**; Harvey steel box \* June 5-**91**; construction and design, Barnes \* Jan 29, Lamont's steel \* Feb 5-**92**
- BALT. & O. 50,000-lb. box, details *R Gaz* \* Mar 27-**91**, iron box *R & Eng* \* Dec -**92**
- BELGIUM, Grand Cen. R. wagon, Paris exhib. *Eng* \* Oct 11-**89**
- BUFFALO, Roch. & Pitts. 60,000-lb. box and truck *R Gaz* \* Dec 19-**90**
- CHESAPEAKE & O., combination *R Gaz* \* Feb 1-**89**; stone \* Sep 23-**92**
- CHICAGO, Bur. & Q. standard *R Gaz* \* June 21-**89**; & N. W. standard, 50,000-lb., box (full) \* Jan 10-**90**; Rock I. & Pac. coal, standard, inset *E News* \* Aug 11-**92**
- DENVER & Rio Grande box, standard gauge *R Gaz* \* Oct 9-**91**
- FRANCE, So. R. cattle wagon, Paris exhib., inset *Eng* \* Nov 8, platform wagon, do. \* Dec 20-**89**
- GERMAN composite *R Gaz* \* Dec 27-**89**
- HOELLENTHAL R., inset *Eng* \* Mar 13-**91**
- INTERCHANGE rules *R Gaz* May 24-**89**, com. report, May 22-**91**
- LAKE Shore, 30-ft. standard *R Gaz* \* Dec 30-**92**

**Cars**, Freight, LEHIGH Valley, 50,000-lb. standard *R Gaz* \* June 8; twin hopper bottom gondola, 60,000-lbs. \* Sep 14 -88; 50-ton capac. platform car \* Aug 16-89

NEW YORK, L. Erie & W. side-dump, 80,000-lbs. capac. *E News* \* Apr 19, 19 -90

NEWPORT News & Miss. Valley gondola *R Gaz* \* Apr 6-88

NORTHERN Pac. hopper side chute *R Gaz* \* Apr 5-89

PENN. 100,000-lb. *R Gaz* \* May 11 -88; 40-ton side-dumping gondola \* Mar 15-89

SPAIN, 13-ton iron ore wagon, Parcocha R., inset *Eng* \* July 17-91

TUBE-frame. Jefferts *Eng* Nov 7 \* 28 -90, do. goods wagons. insets (full) *Inst M E* \* Oct -90, do. cor. *R Gaz* June 5-91, do. and effect on expenses of R's *The Eng* \* Nov 14-90

GATES, the Gold platform (N.Y. eleva. R.) *R Gaz* \* Nov 30-88; B. & A. \* Mar 21-90

GREAT So. & W. of Ireland, composite *Eng* \* Oct 19-88

GREAT Western, England, corridor cars *E News* Mar 26 \* Apr 28, *The Eng* \* Apr 15-92

HEATING, Bache's heater, com. report *F Inst* \* Aug -88; Leland hot water heater *R Gaz* \* Sep 11-91; hot water continuous, Safety Co. \* Sep 6-89

STEAM, notes on, Baldwin, a safety system, Towne *Am M E* \* v 9 -88; safe train system. Gibbs' car *El Wld* \* June 21 -90; appliances *Eng* \* Mar 4-92; Waitt *E & Min* \* Oct 1 -92

*E News* steam from the locomotive. com. report, June 30; Baldwin \* Aug 18-88; non-pressure system \* May 18-89; by direct steam, June 7 \* Nov 22; prog. of steam heating, inset map and ed. (full) \* June 7, 7; Consol. Car-heating Co. systems \* Sep 6, do. aut. temp. regulator, 20-90; diagram \* May 16-91; standard couplings \* June 16; Waitt, Sep 29 -92; P. Atkinson *Lehigh Eng J* June -89

*R Gaz* aut. control of heat, Temple, Apr 13; expts., discuss. 20 \* May 18; Stand. Car Htg & Ventil. Co. continuous system \* June 15; M. C. B. expts., report, inset table and ed. 22-88; essential elements of, W. Johnson, Feb 1; continuous, cir. replies, Mar 22, Apr 12-89; Consol. Car H. Co. couplings \* May 2; econ. of, Sewell, Nov 7-90; Halladay, Sep 23, Waitt, 30-92; econ. of, Sewall *Sc Am Sup* Nov 29 -90; Lanza \* *Soc Arts Mass* -89, *Tech Q* \* Oct -88; and couplers *The Eng* Jan 27-88

- Cars**, Heating, Steam, CALEDONIAN R., exhaust steam ap., Drummond *Inst C E* \* v 92 -88, *The Eng* \* Jan 4, 4-89
- CHICAGO, Mil. & St. P. contin. *R Gaz* \* Jan 13-88, light and heat tender (full) \* June 13-90
- ERIE system *R Gaz* \* Feb 3-88
- GIBBS' safe train system *El Wld* \* June 21-90, steam hose coupler *E News* \* Dec 5-91
- GOLD continuous system, Lehigh Valley *R Gaz* \* Mar 9; storage, test, May 11-88; \* Aug 30-89; coupling and joints \* Mar 21; \* June 6; coil and Baker stove \* Dec 26-90
- MARTIN coupling *R Gaz* July 18-90
- McELROY system, test *R Gaz* Apr 6-88
- NORTH Western system, coupling and trap *E News* \* Mar 30-89; *R Gaz* \* Jan 27-88
- PENN. R., Ely *E News* \* Nov 15, *F Inst* \* Nov *R & Eng* \* Dec -90; Williams' system, expt. *R Gaz* Feb 24-88; continuous \* Mar 22-89
- ROBERTS' system, *R Gaz* \* Apr 17-91
- SEWALL contin. system, hose coupler *E News* \* Nov 21-91; *R Gaz* \* Jan 20-88
- WILLIAMS' system, Penn. R., expt. *R Gaz* Feb 24-88
- INDIAN State carriages, Rajah *The Eng* \* Nov 4-92
- INSPECTION, Susque. Coal Co. *E News* \* Aug 17; Penn. R. \* 31-89; the Ionia *R Gaz* \* Apr 26-89; joint insp., com. report, June 19-91; saloon, So. E. R. *The Eng* \* Aug 14, 21-91
- INTERCHANGE rules, M. C. B. report *R Gaz* Apr 8-92
- IRON and steel, construction, steel plate and malleable iron in, M. C. B. report *E News* \* June 14-90; steel stock car, inset \* July 11-91; iron con., pros and cons, ed. May 19-92; iron dump frt., No. R., France *R & Eng* \* July -88; iron box, B. & O. \* Dec -92; iron construction, Ettenger *R Gaz* Nov 30-88; Am. steel fire-proof postal \* Jan 4-89; Schoen pressed steel, inset \* May 23-90; steel in car construction, Mar 27; Harvey steel box frt. \* June 5; pressed steel and malleable iron con., com. report \* 12-91; construction and design, Barnes \* Jan 19; Lamont's steel \* Feb 5; Harvey steel construction \* 26; iron and steel box, Mex. R. \* Aug 5-92. See also CARS, tube-frame
- LAKE Shore & Mich. So. standard pass. *R Gaz* \* Sep 16-92
- LIGHTING, electric, Leonard *El Eng* July 9-90, Bauer, June 8-92, Timmis *El Rev Lond* \* Sep 11-91, do. *El Rev* Jan 11-

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**92**, with storage (secondary) batteries, A. Brown *El Wld* \* June 1-**89**, Bauer, June 11, Silvey storage battery system \* Dec 31-**92**, Sartiaux *Eng* \* Oct 25-**89**

*E News*, systems, cost. ed. and cor. May 25; with storage (secondary) batteries, A. Brown, July 6-**89**; electric, Penn. R., inset \* Aug 23. do. Sartiaux, Nov 1-**90**; modern methods and ed. Mar 7, 7, 14, comparative merits, various systems \* Apr 18, 25 \* May 2-30 \* Aug 15, 22, the Pintsch compressed gas system \* 29 \* Sep 5, 19, 26, oil lamps \* Oct 10, 17, electric \* Nov 14, 21 \* Dec 5, 19-**91**, Mar 12-26, Apr 2, 9, and ed., 16, 16, Bauer, June 9-**92**

*Inst C E* electric, Sartiaux, abs. v 101 -**90**; Langdon, discuss., inset \* v 106 -**91**; *An Télegr* v 17 -**90**

*R Gaz* electric, Timmis \* May 18-**88**, ed., Feb 8, Waite, Mar 1, Frost dry carburetter system, Penn. R. \* June 7, elec. light car, Cumb. Val. \* 21, elec., Selden, Oct 25, elec. in Am. and Europe, Sartiaux, Nov 29-**89**, by power from the axles, arr., Lond., Brighton & So, Coast R. \* Jan 3, Gibbs, \* Feb 7, light and heat tender, Chic. Mil. & St. P. (full) \* June 13, elec., Leonard, July 11; Frost carburetter tests \* 18-**90**; Gibbs elec. (full) Mar 6, (cost. various systems) cor. Aug 28-**91**

LONDON & S. W. works, Eastleigh, England, *Eng* \* July 29; bogie composite \* Aug 5-**92**

LUBRICATION, Hall *E News* \* June 27-**91**; lubricants, English, and testing *R Gaz* \* Feb 14-**90**

MEXICAN R. iron and steel box *R Gaz* \* Aug 5-**92**

PAINTING, Master Car & Locom. Painter's Assoc. pro. *R Gaz* Sep 20-**89**, Sep 19-**90**, Oct 2-**91**; M'Keon *Sc Am Sup* Oct 1-**92**

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**Cranes** and derricks. *Am C E* travelling, componential trusses for Seaman, insets \* v 23 -**90**; *Am M E* crane chains, experiences with, Dutton \* v 11 -**90**; hydr. trav., Graves \* v 12-**91**; trav. overhead elec., performance, Victorin \* v 13 -**92**, *El Wld* Dec 10, *Iron Age* Dec 8; Am., Suplee *Cassier's* \* Apr \* May; trav. elec., Leonard's control system *El Eng* \* Dec 14-**92**

*Eng* 12-ton steam Goliath, inset \* Jan 3; 10-ton locom. steam \* July 6; electrically worked, Anderson, Sep 14; 25-ton steam, Prince's Quay, Belfast har. \* Nov 9; 20-ton overhead trav., Russell's \* Dec 14-**88**; Whitaker's steam navy \* Apr 26; Paris exhib. \* Sep 13-**89**; 100-ton, Belfast \* Jan 24; 5-ton overhead trav., Belgium \* May 2; 40-ton wharf \* Sep 5; dredging and grab, the Cockburn \* Oct 3; 100-ton trav., Fairfield boiler works \* 24-**90**; 50-ton steam, Fairbairn \* June 5; locom. steam \* 19; derrick, stresses in, Elliott \* July 10; 25-ton trav., Carron foundry \* Sep 4 -**91**; Morgan's and lifting appliances \* May 27-**92**

*E & Min* hydr. trav., Graves \* Feb 7-**91**; *E News* hydr. charging, inset, Feb 7; derrick plant for Equit. building, Denver, Col. \* Aug 22; the Crosby wrt. iron tubular \* Nov 28-**91**; Titan, at Leixoes, Portugal \* June 30-**92**; 6-ton trav., for elevated road erection *E Rec* \* Dec 17-**87**

*R Gaz* trav. and portable drills, etc., So. R. of France \* Jan 13-**88**; 110-ton trav., Morgan engine works (full) \* June 20; hydr. trav., Graves, Nov 21-**90**; pneu. \* June 12; Ridgeway balanced steam hydr. \* July 31; rope driven high speed \* July 10; for railroad uses, Clements \* Aug 14-28-**91**; 100-ton elec., Baldwin locom. works, Bates, inset \* Jan 29; trav. elec., Shaw \* Mar 25-**92**; 10-ton trav. elec., Paris exhib. *Sc Am Sup* \* Sep 21-**89**

*The Eng* 50-ton steam, Firming steel works, Feb 3; 150-ton trav., Abouchoff steel works, St. Petersburg, Feb 17, 17; 15-ton derrick, Butter Bros. Mar 2; 12-ton hydr. wharf, 30; 25-ton Fairbairn wharf, Apr 6; 3-ton locom. steam, Spanish R's, 6; trav., fly rope, 20; 10-ton breakdown trav., Indian State R. June 1, 1; 25-ton trav., Penn. R. July 6, 13, 13; 25-ton portable steam, New Zealand Gov't. R's, 27; 20-ton trav. elec., working of, Anderson, Sep 14; block setting Hercules, Douglass harbor

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works, Dec 14-**88**; 25-ton trav., Deptford elec. light station, Aug 23; 10-ton trav. elec., Paris exhib. 30; Guyenet system, Sep 6-**89**; crane posts, stresses in, cor. \* Aug 29-**90** \* Feb 13-**91**; str., twin screw pontoon, Buarque de Macedo \* Jan 1-**92**. See also DERRICKS

**Crank**, crank pins securing, method of inserting, Collins *Am M E* \* v 9-**88**; a suggested new form of, Palmer, cor. *E News* \* Sep 6-**90**; transmission expts. *Pwr* \* Sep-**89**; the Edwards *Sc Am Sup* \* Apr 14-**88**; cranks set on an angle \* Oct 17-**91**

**Cream** separator, the Alexandra centrif. *Eng* \* May 1-**91**

**Cremation**, prog. of, Cobb *E Mag* \* July-**92**; Jenner *Sc Am Sup* July 28-**88**; of the dead, W. Clarke, May 3-**90**

**Crematory** furnace, Key's *Eng* \* Mar 15-**89**; the Manchester crematorium (dead bodies disposal) \* July 31-**91**; crematory at Zurich, Geiser, abs. *Inst C E* v 99-**90**, *Schweiz Bauz* \* v 14-**89**

**Criminology** researches, Aaron *Sc Am Sup* June 18-**92**

**Crookes**, William, por. *El Wld* \* Feb 7-**91**, por. *Sc Am Sup* \* Apr 21-**88**, por. \* Mar 7, 7-**91**, *Electrician*

**Crosby**, Oscar T., por. *El Wld* \* May 31-**90**

**Crosland**, William M. *Inst C E* v 99-**90**

**Cross**, Charles R., por. *El Wld* \* Jan 3-**91**

**Crossties**, Railroad, life *E Mag* Apr-**91**; in France *E News* Dec 14-**89**; consumption of forest supplies by railroads, Tratman, table, Aug 30-**90**; preserving methods, Reed, Sep 20-**90**, Sep 19-**91**; consumption, France, Mathieu, abs. *Inst C E* v 98-**89**, *Rev Chemins* July-**89**; treatment, Austrian R's, Karplus *R & Eng* Dec-**88**, *Vienna Zeit Eisen*; ties in India *R Gaz* Aug 23-**89**

**METALLIC** (full) *E & Min* \* Dec 29-**88**; steel, N. Y. elevated R's \* Mar 2; Aiken's hydr. machine \* Nov 2-**89**; ed. Feb 7-**91**; steel \* Aug 13-**92**

*E News* steel, maintenance expenses on, Post, June 30-**88**; some Am. June 29; the Flower-Heller \* July 27; Z-iron, Belgium \* Sep 7, report, 7; Mar 16. May 11, Nov 23-**89**; report, Aug 30-**90**; 'standard' steel \* Feb 7; Servis, Apr 4; Belgian, July 18; Sandburg, Aug 22-**91**; Hartford steel tie and 100-lb rail, N. Y. Cen. R. \* Mar 12-**92**

*Inst C E* metal sleepers, economic value, Hohenegger, abs. v 91-**88**, *Org Forts Eisen* -**87**; value of pickling, Ribar

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*Inst C E* v 91 -88, *Zeit Ost Ing* -87; steel, manuf., inseparable clip type, Bamber *Inst C E* \* v 108 -92; France *R & Eng* \* June; Mayer \* Oct -89; Europe \* May -90

*R Gaz* Hartford steel \* Dec 7-88; elastic tie plate, Sandberg's \* Mar 8 \* Apr 5-89; Penn. experimental \* June 6; the Bonzano steel \* Oct 17-90; Indian R's, June 5-91; Reece \* Feb 19; N. Y. Cen. steel \* July 22, manuf. of, Bamber \* 22; Heindl steel, reports of use, Dec 23-92

*Sc Am Sup* \* May 30-90; Hartford steel \* Feb 9-89, *R Rev*; Indian State R. steel sleepers *The Eng* Nov 30-88; Cabry do., No. E. R. \* Jan 4-89

**Crowe**, William M. *Inst C E* v 93 -88

**Crowds**, weight of *E Rec* Dec 24-92

**Crushing** and amalgam. mill, the Crawford *E & Min* \* July 23-92. See also DISINTEGRATORS

**Cryolite** mine, Greenland *Sc Am Sup* Mar 14-91

**Crystallization**, Liveing *Sc Am Sup* \* July 25-91, *Am J Sci*; crystals *Locom* Mar -92

**Cuba**, business opportunities, Chibas, insets *E Mag* \* Nov -92; Havana, St. Jago trade in '87 *The Eng* Aug 3-88

**Culvert**, Harlem arch *E News* \* Apr 26-90. See also RAILROADS, culverts

**Cundy**, John *Inst C E* v 109 -92

**Cupola** furnaces. See BLAST furnaces; FOUNDRIES

**Curran**, Henry B., por. *E & Min* \* Dec 27-90

**Current** meter observations, Miss. river, report *F Inst* Apr -88

**Curve** ranger, Trotter's *Sc Am Sup* \* Jan 11-90 \* Dec 12-91, *Eng. The Eng.* See also INSTRUMENTS; SURVEYING

**Curves**, the false ellipse, Wurtele *Am C E* \* v 24 -91; the logarithmic, practical uses, Cox *E News* \* Aug 29-91; radii of curvature geometrically determined, MacCord (fully) *Sc Am Sup* \* Jan 5-19 \* June 22 \* July 13 \* Aug 3-89 \* Jan 11 \* Oct 18-90, geomet. considered \* Dec 10-92, instruments for drawing \* Dec 28-89 \* Mar 29 \* July 12 \* Sep 20-90 \* Apr 4-91 \* May 14-92

**Cyclones**, whirlwinds *Sc Am Sup* \* Aug 11-88, *La Nature*. See also STORMS; WIND

**Cyclostyle** duplicating ap., com. report *F Inst* Apr -88

**Dady**, Jamsetjee N. *Inst C E* v 92 -88

**Daft**, Leo, por. *El Wld* \* Mar 30-89

**Dakota**, Black Hills, ore deposits. Carpenter (full) *Am Min* \* v 17-89

**Dams**, or high walls to resist the pressure of water. Francis, discuss., insets *Am C E* \* v 19 -88

*E News* great. of world, inset \* Jan 7, 7; high masonry, theory of, Church, report \* 14, do., Fteley, Feb 4, 11. det. of profile, Morley \* Aug 11, Francis, an error of theory, ed. \* Nov 17. earthen, how to build \* 17, sluice gates \* 24, strains in, Flagg, cor. \* Dec 8, curved, Church \* 22-88; and reservoirs, state supervision of, ed. Aug 24, 24-89; earthen vs. masonry. Follett, Jan 2, 9; flow of thick sheets of water over, Herschel \* Nov 10-92

*E Rec* hillsides protection. Mahan \* Dec 6-90; earth and masonry for irrig. works. Follett, May 14, 28; back water from, July 9; design of retaining walls. K. Allen, Nov 12 \* 19-92

*F Inst* compound dikes (stone), most econom. cross-section, d'Auria \* June -88; notable (Irrig. in India), Barois, *R & Eng* \* Dec -92; masonry, design and construction, Wegmann, bk. *The Eng* Oct 26-88; dangerous, Sep 13-89. See also CANALS; EARTHWORK; HARBOR eng; HOLLAND dikes; IRRIGATION, India; RIVERS; RESERVOIRS; WATER-works

ATHENS, Ga., Ledlie *E News* \* May 5-88

AUSTIN, Texas. Col. river *E News* \* July 11-91; Fanning, report, Frizell \* Sep 29-92

BEAR Valley, Cal. See DAMS, Sweetwater

BEETALOO water-works, So. Australia, concrete *Eng* \* July 3-91; Moncrieff *E News* \* May 30 \* Sep 19-91; *R & Eng* \* July -91; *The Eng* \* May 8-91

BETHEL, Ct., water-works, and filter bed, proposed *E News* \* Mar 7-91

BHATGARH *R & Eng* \* Aug -92

BLACK Eagle Falls, Great Falls, Mont., Parker, discuss., insets *Am C E* \* v 27 -92; *E Rec* \* Oct 8-92

BOIRE river *E News* \* Apr 26-90

BUTTE City water-works, concrete masonry *E News* \* Dec 15, 22 -92

CAMBRIDGE water-works, Mass., Stony Brook, Barbour *E Rec* \* Jan 5-89

CASTLEWOOD, Denver Water Storage Co. *E News* \* Mar 22 -90

**Dams**, COFFER-dams and floating caissons, R. Hunt *E & Min* \* July 19, 26-**90**

CONEMAUGH, Johnstown, Pa. *The Eng* \* June 21-**89**, *E Rec*

CROTON water-works, N. Y., Convent ave. gate-house *E News* \* Sep 1, 15-**88**; inset \* Nov 15, 15-**90**; inset \* June 2-**92**; Fteley report *E Rec* \* Oct 18-**90**. See also DAMS, Quaker bridge, Sodom

CURVED vs. straight, Bell *E News* Mar 31; strains in, Church, cor. \* Dec 1. cor. \* 28-**88**; cor. Aug 16; masonry, strains in, Martin, cor. Sep 27-**90**

DAVIS Is. movable, Ohio river, Pitts., Pa. *Sc Am Sup* \* Aug 1-**91**

DENVER, Col., Citizen's water Co., large, n *E News* Sep 20-**90**. See also DAMS, Castlewood

ENGLISH, Sierra Co., Cal., destroyed *E News* \* July 6-**89**

FOLSOM, Am. river, Cal. *E News* \* Oct 17-**91**, *R & Eng* \* July -**92**

HOLYOKE, Mass., Whiting st. *E News* \* Sep 6-**90**

KINGSTON's floating scouring *Eng* \* Oct 26-**88**

KIRK wooden *E News* \* Apr 28-**92**

LAWRENCE, Merrimac river, Hale *E Rec* \* May 4-**89**, *J Assoc E Socs*

LUMBER, Penn., inset *E News* \* Sep 5-**91**

MOVABLE, Pochet's (full) *Sc Am Sup* \* May 24-**90**, *Genie Civil*. See also DAMS, Davis Is.

MUSKINGUM river *E Rec* \* Mar 8-**90**

NEW Brunswick water-works, a dubious, Hill, cor. *E News* \* June 16, proposed \* 23-**88**

NILE barrage *E News* Sep 27-**90**

NORTHFIELD, Vt., a very bold arch *E News* \* Sep 20-**90**

PAWTUCKET water-works, R. I. *E News* \* June 1-**89**

PECOS river, N. M., rock fill *E News* \* May 17-**90**. See also DAMS, reservoir

PERIYAR, Madras *Eng* \* Nov 25, inset \* Dec 9, construction *E Rec* \* Dec 31-**92**

POTOMAC river, Wash. water-works, constructing, Chittenden, inset *Am C E* \* v 18-**88**

QUAKER bridge, Croton aqueduct, N. Y. water-works *E News* \* Feb 4, table, 11, design of. ed. 25, Marichal, cor. Mar 10; report and ed., inset \* Nov 3, 3-**88**; Fteley, Oct 11-**90**; map *E Rec* \* Oct 6; report *R Gaz* \* Oct 12, 26; Tratman *The Eng* Jan 27, Apr 20, Nov 30-**88**. See also DAMS, Croton

- Dams**, RESERVOIR, safety of, Kresnik *E & Min* \* Mar 1-90, *Inst C E*; rock fill, ed. *E News* July 28, Aug 11, and Schuyler, cor. Sep 22-88; and Conn. law, ed. Aug 24-89; European, Kresnik, Mar 15; Apr 12; measures for safety of, do. May 10; and embankments for water-works, inset \* June 21-90. See also RESERVOIRS; WATER-works
- SODOM, Croton, N. Y. water-works, n *E News* \* Dec 1-88; Oct 25-90; *Sc Am Sup* \* Jan 5-89
- SOUTH Fork reservoir failure, cause, com. report, discuss. (very full), insets *Am C E* \* v 24-91; *Eng* \* June 7-89; and Johnstown disaster *E News* \* June 15-89; com. report *E Rec* \* Aug 29 \* Sep 5-19-91
- SWEETWATER, San Diego Bay, construction, Schuyler, discuss., insets *Am C E* \* v 19-88; and Bear Valley, do. *E News* \* Apr 7, F. Brown (Redlands, Cal.) \* June 23, Schuyler \* Oct 27-88; Nov 23, 30-89; Schuyler, abs. *Inst C E* v 97-89
- TANSA, Bombay water-works, inset *Eng* \* Apr 29; *E News* \* June 30-92; *E Rec* \* Dec 19-91
- VYRNWY lake masonry, Liverpool water-works *E News* Dec 29-88; and ed. \* Aug 18-92; *R & Eng* \* Jan -89, *Industries*; *The Eng* \* June 27-90
- WALNUT GROVE, Ariz., disaster *E & Min* \* Mar 1-90; *E News* Sep 22 \* Oct 20, Nov 3-88; \* Mar 8-90
- WATER-works, of U. S., (list) *E News* June 15-89. See also RESERVOIRS; WATER-works
- WESTPHALIA, Verse river, proposed, inset *The Eng* \* Feb 1, 8-89
- Daniel**, John, por. *E & Min* \* Feb 28-91
- Davenport**, Thomas, (inventor elec. motor), Pope, por. *El Eng* Jan 7; some cor. *El Wld* Apr 25; *St R J* \* Apr -91
- Davidson**, Robert, por. *El Wld* \* June 20-91
- Davy**, Humphrey *Eng* Jan 8-22, Feb 12-92
- Day**, David T., por. *E & Min* \* May 23-91
- Death**, Mitchell *Sc Am Sup* Oct 15-92, *Nat Sci*; origin of, Gardiner *Tech Q* July -91
- Dean**, John, por. *E & Min* \* Dec 20-90
- Debts**, county, of U. S., diagram *E News* \* Sep 6-90
- De Camp**, Edward F., por. *E & Min* \* Sep 12-91
- Decorticating** machinery *The Eng* \* Dec 27-89
- De Lamar**, J. R., por. *E & Min* \* Sep 5-91
- Delta** metal. *E News* July 26-90

**Denham**, Henry M. *Inst C E* v 91 -88

**Denny**, Robert *Inst C E* v 95 -89

**Denny**, William (ship builder) bk. n *Eng* Jan 25-89

**Dentistry**, mechanics of, Sweet *Cassier's* Nov -92

**Deserts**, Am. Sahara, 'Valley of Death' *Locom* Jan -91; great, of the earth, James (full) *Sc Am Sup* June 22-89

**Derricks**, hydr. and steam. Brown Bros. *Eng* \* Apr 18 90; stresses in, Elliott \* July 10-91; hydr. hoist, H. M. S. Vulcan \* Nov 18-92; derrick plant for Equit. building, Denver, Col. *E News* \* Aug 22-91; 15-ton. Butter Bros. *The Eng* Mar 2-88. See also CRANES

**Devonshire**, Duke of (W. Cavendish) *Inst C E* v 107 -92

**Diamond** mining and industry, etc., polishing *Eng* \* Feb 8-89; washing machinery \* Apr 25-90; Kimberley stats., So. Africa, Sep 4-91, report Dec 23-92, do., Stonestreet *E Mag* \* Aug -91, do. *E & Min* Sep 19, discov., Thorburn, Oct 24-91; Kimberley indus., Churchill, *Pop Sci* \* Aug -92; mines, Africa *Sc Am Sup* \* Aug 22-91; the De Beers mine *The Eng* Aug 17-88. See also GEMS

**Dibblee**, Frederick L. *Inst C E* v 97 -89

**Dick**, Charles *Inst C E* v 94 -88

**Dickinson**, George C. *Am C E* v 26 -92

**Dictionary**. See CENTURY dictionary

**Diet**, proper, for hot weather, Davies *Pop Sci* July -92

**Dikes**, Holland, notes. Starling, discuss., map, insets (very full) *Am C E* \* v 26-92, do. *R Gaz* Nov 11-92; compound (stone), most economical cross-section of, d'Auria *F Inst* \* June -88. See also CANALS; DAMS; RESERVOIRS; RIVERS, etc.

**Dirks**, Justus *Inst C E* v 92 -88

**Disasters**, in Aug., ed. *E News* Sep 8-88; great, earthquakes, floods, etc., ed. July 6-89. See also BRIDGE accidents; BOILER explosions; FLOODS; STEAMERS; RAILROADS, accidents, etc.

**Discoveries**, great, of past sixty years *Locom* Sep-Nov -89

**Disinfecting** ap., Koch, abs. *Inst C E* v 96 -89, \* *Bul Soc Mul* -88; *Sc Am Sup* \* June 30-88, *The Eng*

**Disintegrator**, the devil *Eng* \* Aug 10-88; trials *The Eng* \* June 27-90. See also CRUSHING, GRINDING

**Disk**, hollow cast iron, strains in. Leverich *Am C E* \* v 18-88

**Dividing** engine, 40,000 lines to the inch, Rowland *E News* Feb 18-88

**Diving** boats *Eng* Mar 15, Apr 5-**89**; Stove's diving dress \* Mar 28-**90**

**Dixon**, John *Eng* Feb 6-**91**, *Inst C E* v 104 -**91**

**Docks**, Auckland, N. Z., calliope graving, Swainson *Inst C E* v 101 -**90**

**BARRY**, works, J. Robinson *Eng* Apr 11-**90**, hydr. machinery and mode of tipping coal, discuss., insets *Inst C E* \* v 101 -**90**

**BOMBAY** graving, proposed *Eng* \* May 18-**88**

**BRISTOL** *The Eng* \* Oct 14-**92**

**BROADSIDE** dock slip, for ships *Sc Am Sup* \* Aug 8-**91**

**BROOKLYN** Navy Yard dry-dock, Simpson *Eng* \* Aug 22, *R & Eng* June -**90**

**CARDIFF** schemes, Bute dock, map *The Eng* \* Dec 9-**92**

**CHATHAM** *The Eng* \* July 24-**91**

**CUBA**, crib for Signa Iron Co. *E News* \* Apr 9-**92**

**DRY-docks**, of world *R & Eng* Aug -**89**; Wivenhoe *The Eng* \* Feb 21-**90**. See also **DOCKS**, names of places

**ESQUIMALT**, Brit. Columbia, inset *Eng* \* July 20, inset \* 27-**88**

**FLOATING**, and pontoon, Taylor *Eng* \* Aug 10, do. *Sc Am Sup* \* July 7-**88**; offshore, Hamburg \* May 10-**89**, do. *The Eng* \*

Mar 11-**92**; Limerick, steel gates, Hall *E Rec* Apr 10-**90**, do. *Inst C E* v 97 -**89**

**GLASGOW** harbor *Eng* \* Aug 9-**89**; the Cessnock *E News* June 2-**92**

**GRAVING** *Eng* Nov 18-**92**, *Inst C E*. See also **DOCKS**, names of places

**HALIFAX**, Nova Scotia, graving *The Eng* \* Feb 28-**90**

**HAMBURG** floating offshore *Eng* \* May 10-**89**, *The Eng* \* Mar 11-**92**

**HAVRE** port dry-dock *E Rec* \* Dec 3-**87**, \* *Genie Civil*; Bellot dock, Desprez, abs. *Inst C E* v 101 -**90**, *An Ponts* \* v 17-**89**

**HULL**, Alexandra, Hurtzig *Eng* Feb 10, discuss., inset *Inst C E* \* v 92 -**88**

**INDIA**, East & West, arbitration *Eng* Dec 28-**88**

**LEAGUE** Island dry-dock *E News* \* Mar 14-**91**

**LIMERICK**, floating, gates, Hall *E Rec* Apr 10-**90**, *Inst C E* v 97 -**89**; failure of walls and methods for reconstruction, Hall, inset \* 103-**91**

**LIVERPOOL**, port and Mersey river, dredging *Eng* \* May 30 \* June 6; Lyster, Jan 17, extensions, discuss., insets (very full) *Inst C E* \* v 100 -**90**; Mersey estate *Inst M E* July -**91**

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**Docks**, MARE Island, Cal., dry-dock *E Rec* \* Feb 13-**92**

MARQUETTE, Mich., ore dock, Duluth, So. Shore & Atlan. R.  
*E & Min* \* Jan 10-24 **91**

NEW York dock walls *E Rec* \* Sep 3, Oct 1-**92**

PORTSMOUTH dockyard *Eng* July 29 \* Aug 5, 5, lifting ap., Corner, 26-**92**

PRESTON scheme, ed. *The Eng* June 29-**88**

PUGET Sound, Wash., U. S. Naval station, inset *E News* May 19-**92**

SAN Francisco dry-dock, hydr., Union Iron works *R Gaz* \* Nov 27-**91**

SOUTHAMPTON tidal *Eng* \* Sep 12, inset *The Eng* \* July 25-**90**

**Domestic** motive power by atmos. exhaustion. Dollfus, abs. *Inst C E* v 93 -**88**, *Bul Soc Mul* -**88**; motors worked by rarefied air, Bourdenoot, abs. v 96-**89**, *Compt r* Feb 1-**89**

**Dolivo**-Dobrowolsky, Michael Von, por. *El Wld* \* Mar 19-**92**

**Dom Pedro**, ex-Emperor of Brazil *Inst C E* v 108 -**92**

**Douglass**, Archibald Bryce - *The Eng* Apr 10 **91**

**Dovetails**, holding power of, Poe, report *E News* \* Dec 20-**90**

**Downes**, Charles C. *Inst C E* v 92-**88**

**Downing**, Samuel F. *Inst C E* v 109 **92**

**Drainage**, tables, G. Johnson *E News* May 5, 12-**88**; blunders, Webster *E Rec* \* Dec 10, 24 **92**; hints, Chandler *Tech Q* Dec -**88**. See also SEWERAGE

CHARLESTON, S. C., tidal *E News* Oct 25-**90**

CHICAGO, drainage canal *E News* \* June 2, 30-**92**; *E Rec* May 23-**91**

FENS and lowlands, by gravitation and steam power, Wheeler, bk., Spon. Lond. -**88**

HOUSE, domestic and water supply, Hartford *E Rec* \* Apr 2, 16-**92**; Chandler *Sc Am Sup* Jan 26-**89**, *Tech Q*

LOUGH Erne, Price, discuss., inset (full) *Inst C E* \* v 101 -**90**

KANKAKEE marsh, Chic. canal *E News* \* Nov 3, 3-**92**

MEXICO, Valley of, Chism, map *E & Min* \* Dec 8, 15, 22-**88**, map *E News* \* Aug 10-**89**; City of Mex., hist. sketch, Noll *E Rec* Mar 16-**89**; Val. *Sc Am Sup* \* Aug 10, map *The Eng* \* June 28-**89**

WIESBADEN-Essen-Halle, abs. *Inst C E* v 96-**89**, *Deut Vier Ges* -**89**

**Draw-bridges**. See BRIDGES, draw-bridges

**Drawing**, section lining, standard, Van Vleck *Am M E* \* v 9-**88**; Holman *Cassier's* \* Sep -**92**; drawing-board, vertical *Eng* \* Jan 13, do. Vorth's *E News* Apr 7-**88**; section-liner and scale divider. Both's \* Oct 12-**89**; T square. Deane's adjustable \* Sep 13-**90**; essentials of mechanical drawing, Forney (very full) *R & Eng* \* Mar - \* Dec -**90** \* Jan - \* Dec -**91** \* Jan -**92**; as a means of education, Ablett *Sc Am Sup* July 7-**88**; simple method (artistic), Jacquot \* Mar 29-**90**. See also INSTRUMENTS, curve rule

**Dredge**, James. Wiley, por. *Cassier's* \* Feb -**92**

**Dredgers** and excavators. Panama canal, Williams, insets *Am C E* \* v 19-**88**; steam excavs., Clements *Am M E* v 9 -**88**; Bennett elec. and amalgamator *El Rev* \* May 23-**91**

*Eng* double-ladder. Swansea harbor, inset \* July 13; frictional gear for, Griffith \* Aug 24; 'Kuphus' hopper, Bombay Port, inset \* Dec 7-**88**; hopper suction 'Libana,' Port of Libau, inset \* Jan 11; shore delivery for lake Copais \* Feb 1; dredging cost, Apr 26-**89**; sand pumping, Mersey bar, ed. Apr 11, and docks \* May 30 \* June 6; Cockburn crane and grab \* Oct 3-**90**; for excav. gold-bearing river beds \* Jan 9; steam crane excav., Weser river imp. works \* 16; dredging and amalgam. plant, inset \* Mar 27; Manchester canal soil transporter, inset \* July 24-**91**; floating elevator, transformation \* Aug 19; Jupiter twin screw suction pump \* Sep 30-**92**

*E News* Panama canal plant \* Aug 18, 25; French suction, Vernandon \* Nov 10-**88**; English, cost of, May 11; Lobnitz rock \* Jan 26, work of \* Oct 19-**89**; German stone \* Aug 16-**90**; Man. canal soil transporter, Sep 5-**91**; ap. for N. Y. harbor, Edwards, inset \* Mar 19; the Booth pump \* 26; trestle filling, N. Or. & N. E. R. \* Aug 4; dredging on Pac. coast, Miller, 4 \* 11-**92**; Lobnitz rock, removal under water without explosives *E Rec* \* Oct 12-**89**; four-screw hopper, Walker \* Feb 13-**92**, do. inset *Inst C E* \* v 107 -**92**; the von Schmidt, Higgins, inset \* v 104-**91**; hydr., N. Y. harbor *R Gaz* Aug 28-**91**; Jandin's hydro-pneu. jointed conduit *Sc Am Sup* \* Mar 9-**89**

*The Eng* dredging machinery, subaqueous rock, Suez canal, Mar 9; combined traction engine, crane and excav. 30; hopper, Glasgow exhib. Sep 7, 7-**88**; Wilson's single chain grab \* Nov 28-**90**; hopper, for New So. Wales, inset \* Apr 8; sand pump, Thyboron, inset \* Sep 16-**92**. See also under CANALS; HARBOR eng.

**Drexel** Institute, Phila., Depew *E Mag* Feb -92

**Drifting** tests, autographic, Goodman *Inst C E* \* v 92-88

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ADMIRALTY specifications *El Rev* May 3-90

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- ARMATURE reactions and motors, theory, Swinburne *El Rev Lond* \* Feb 14, 21, discuss. Mar 28, Apr 4, *El Rev* \* Mar 15-**90**; ring, relative proportions of, Dobbie *El Wld* \* Jan 26; methods to determine equiv. area of, Ferry, Aug 31-**89**; reaction in constant current, Carhart (full) \* June 6; reactions, Wagner \* Aug 22-**91**, *Technic*
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- BROWN'S, transmiss. of power by *Eng* \* Apr 20-**88**
- BRUSH alt. current system *El Eng* \* Aug, *El Rev* \* July 13; arc, effic. etc., Melbourne exhib. lighting, Murray *El Rev Lond* Nov 15-29-**89**
- COMPOUND winding, theory of for constant poten., Bell *El Eng* Nov 26, *El Rev* \* Nov 29-**90**; patents (full) *El Rev Lond* Nov 30, Dec 7-28-**88**, Mar 1-15, May 31, June 7, 14, July 5-**89**, machines, July 25-**90**
- CONTINUOUS current machines design, Jamieson (full) *El Rev Lond* \* Mar 8-**89**, *Inst C E*
- DESROZIER'S disk-dynamo, Meylan, abs. *Inst C E* v 95-**89**, *Lum Elec* v 29-**88**
- EVANS friction cone direct driving system (theory) *El Eng* \* Mar 25-**91**; *El Rev* \* Sep 14, belt *El Wld* \* Sep 14-**89**
- EDISON, and motor *El Rev Lond* \* Aug 21-**91**; *Sc Am Sup* \* Mar 5-**92**; Paris exhib. *The Eng* \* Nov 15-**89**
- EICKEMEYER'S *El Eng* \* Mar -**88**
- FERRANTI system, Haskins *El Rev* Feb 28-**91**; 10,000- light, Grosvenor gallery. Lond. *Sc Am Sup* \* Dec 15-**88**; *The Eng* \* Nov 1-**89**
- FIELD-magnet coils for, Kapp *El Wld* May 3-**90**
- FRITSCHÉ wheel *El Rev* \* Apr 6, n *Sc Am Sup* \* Apr 20-**89**

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GOOLDEN-Willans combination, tests *El Wld* \* Dec 6-**90**, *Electrician Lond*

HOCHHAUSEN arc light machine *El Eng* \* Apr 23-**90**

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MORDEY alt. current *Eng* \* June 1-**88**

MULTIPOLAR, low speed, for contin. currents, Perret *El Eng* \* Nov 26, do. *El Rev* \* Nov 29, do. *El Wld* \* Nov 29; Riker low speed contin. current, and motors \* Dec 17-**90**; at Frankfurt exhib., Kolben \* Nov 25 \* Dec 2; design, Esson \* May 6, 20, do. *El Rev Lond* \* Apr 10, 24, May 1, do. *El Rev* \* May 16, do. *El Wld* \* May 2, 9, 23-**91**; *Power* \* Dec -**92**

OERLIKON three phase alt. current *El Rev Lond* \* Aug 28-**91**

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PLATING, Hopkin's *Sc Am Sup* \* Mar 14-**91**

PYKE & Harris alt. current *El Rev Lond* \* May 6, 13-**92**

PYLE aut. steam engine and (multiple cyl.) n *El Wld* \* Aug 29-**91**

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SPARKING and flashing of, M'Berty (full) *El Rev* \* May 28-**92**. See also ELECTRIC sparking

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THOMSON'S *El Rev Lond* \* Aug 15-**90**; and lighting ap. manuf.,

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THURY, the *The Eng* July 19-**89**

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WESTMINSTER, the *El Wld* \* May 18-**89**

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WIRES sizes, table *El Rev Lond* Nov 16-**88**

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**Easten, James** *Inst C E* v 95—**89**

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**Ejector** and its work, Hiscox *E Rec* \* Nov 19—**92**. See also INJECTOR

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ACCUMULATORS. See STORAGE batteries

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AGRICULTURE, in, cost, ed. *El Eng* May 11-92

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ALTERNATORS coupling in series, Boucherot *El Wld* \* Dec 27 -90

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AMMETER, the Wood *Sc Am Sup* \* Jan 14-88. See also ELEC. meters

AMPERE and volt meter, Sankey *El Rev Lond* \* Nov 27, Dec 4-91. See also ELEC. meters

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**Electric INSULATION**, *El Eng* and installation of wires, E. Thomson, Mar. do. *El Rev Lond* Mar 23, do. *El Rev* Feb 25-**88**; resist. of elec. light installs, Jamieson, Jan 25, do. *El Eng* Oct -**89**; resist. measuring, Patterson \* May 20-**91**, glass and porcelain, tests, F. Jones, Feb 10; Edison, July 13, do. *El Wld* July 2, do. *Sc Am Sup* Aug 6, do. *El Rev* July 2; oil vs. air as, Wins. Nov 26, do. *El Wld* Nov 26, Dec 3-**91**, Dec 10-**92**, do. *El Eng* \* Nov 23; resist. of cotton and silk covered wires, Luquee \* Dec 28; micanite and applic. to armature insul., E. Thomson, 28, do. *El Rev* \* Dec 31, do. *El Wld* \* Dec 31-**92**

*El Rev Lond* insul., okonite, June 8; Picou, Nov 23-**88**; resist. of station, Jamieson, Jan 25; measurements at the Vienna Palace, Waltenhofen \* Feb 15, 22; standard for light circuits, Fish, 15; thickness of, A. Thompson, 22-**89**; of cables, influence of elec. tension on, Palaz, Oct 24-**90**; high, of wires, commercial measurement, Hering \* Mar 27-**91**; oil, as, expts., Hughes, Mar 11-**92**; in marine work, hist. *El Rev* Dec 14-**89**; insul. materials behavior under high poten. differences *El Wld* \* Apr 9 **92**; wire insul. measurement, Picou, abs. *Inst C E v* 92-**88**

**INSURANCE**, light and power rules, Boston Manuf's. *El Eng* Aug 20; rules, Hartwell (full) *El Rev Lond* Sep 12; and regulations, N. E. Ins. Exchange (full) Dec 26-**90**; rules, England *El Rev* Jan 14-**88**; station ins., Barton, May 31, July 19-**90**; and wiring rules, com. report, Sep 12-**91**; elec. and ins. interests, Alexander *El Wld* Feb 22; stations hazards, Low *Sc Am Sup* Apr 9-**92**; lighting and fire ins. rules, Hartwell *The Eng* Dec 5-**90**

**INVENTIONS**, of Henry Pinkus, Tanner *El Rev Lond* \* Jan 8-22-**92**; effect of, Brackett *El Rev* Apr 18-**91**; progressive \* Jan 2-16-**92**

**INVESTMENTS** in country districts, Black *El Wld* Aug 20-**92**

**IRRIGATION**, Collins *El Eng* \* Apr 16-**90**

**KIRCHOFF'S** laws and applic., Rimington (full) *El Rev Lond* \* Mar 2-30 \* Apr 6, 13-**88**

**KITE**, Franklin's expt., McAddie *El Rev* \* Aug 22-**91**, *El Wld* Sep 24-**92**

**LABORATORY**, Hopkins *Sc Am Sup* \* Mar 21-**91**

**LAMP** posts, Berlin *E News* \* June 16-**88**

**LAMPS**, and wire calcs. without tables or curves, Roberts *El Eng* Aug 3-**92**; max. eff., Howell *El Rev Lond* June 29-**88**. See also under **ELEC.** Co's, Edison, etc. — **Lighting**

**Electric LAMPS.** ARC, and mechanism. S. P. Thompson (very full) *El Eng* May \* July - Sep, *El Rev Lond* \* Mar 15-29 \* Apr 12, 19, *El Rev* Apr 13, (full) *Sc Am Sup* \* Apr 20, 27-, **89**; effic., Nakano *El Eng* \* July, *El Rev Lond* \* Sep 6, (full) *El Wld* \* June 1-**89**; Brush double carbon, legal decis. *El Wld* Jan 4, do. *El Rev* Jan 4; universal \* Oct 11-**90**; cost of lighting (various Am. cities, 38) Mar 26; the Riedel \* Apr 9-**92**; manuf. for low tension circuits *El Wld* \* Apr 30-**92**; Saundersons \* June 7-**90**, *El Eng Lond*; light of *Eng* May 6; the Crompton-Crabb \* June 24-**92**; and incand., probs. in the physics of, Fleming *Sc Am Sup* \* Aug 23-**90**

**CARBONS**, properties of, Best (full) *El Eng* \* Aug -**88**; Fisk, July 27-**92**; life and effic., Marks (full) \* May 28, *El Rev Lond* Aug 8, (full) *El Rev* \* May 31-**90**; tests, Peck, Feb 22, *El Wld* Feb 22, Law, 22, life and effic., Marks (very full) \* May 31-**90**; different forms, Warner, Sep 19-**91**; Fisk, July 23; Nutting's carbon feeding \* 30-**92**

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**INCANDESCENT**, max. effic. of, Howell, discuss. *Am Inst Elec Engrs* May -**88**, (full) *El Eng* \* May -**88**; relation between initial and average effic., Peirce \* July; filaments form and effic., Reed, Dec -**89**; data and testing, Puffer (full) \* Jan \* Feb \* Apr 2; Jenks' air space cut out \* June 11-**90**; rating candle power of, Bell, Feb 25; the Beacon vac. pump for exhausting \* Mar 4; wiring rules and formulas, Hering \* Apr 1, 8, Loomis 15, Pike 29; highest econ. in, Leonard 15; Grier 22; econ., Weaver, June 3; Edison vs. U. S. Co. Dec 16-**91**; commercial rating of, Wirt \* June 22; life and effic. test of, Thomas, July 13; life of, relative to mercury and metallic vac. pumps \* Dec 14-**92**

*El Rev Lond* 'flashing' carbon filaments at different temps., Powell, May 4-25; effic. with direct and alt. curs., Ayrton, Perry, June 1; sectional testing of filaments, Powell, Oct 5-**88**; form and effic. of fils., Reed, Dec 20, 27; heating of, Ram, 6 \* 13-**89**; highest econ. of, Leonard, Apr 24; Grier, May 8, econ., Russell, 8, 15-**91**; Edison pat. Am. decis. Oct 21-**92**

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*El Wld* max. effic., Howell \* Apr 14, 28 ; (wiring) leads, table, July 14-**88** ; relation between initial and av. effic., Peirce (full) \* June 8 ; fits. from and effic., Reed \* Nov 30, shape and size do. discuss., Dec 14-**89** ; Berrenberg's vac. pump, \* Apr 26 ; life of, table, May 3 ; Edison special. Jackson, Sep 27-**90** ; highest econ., Leonard, Apr 18 ; Grier, 25-**91** ; Ries' regulating socket \* Mar 19 ; curves and wire calcs. without tables, Roberts \* July 2 ; life and effic. test. Thomas (full) \* 16, do. Gossler (full) \* Sep 17 ; age-coating in, Nichols \* Nov 12 ; pats., separable or detachable, Böhm \* Dec 3 ; advantages of forcing at expiration of their life, Hering \* 24 ; life and effic. tests, Feldmann \* 17-**92**, *Electric Lond*

*Eng* glow lamp pats., ed. July 20-**88** ; deterioration of, ed. Jan 23-**91** ; glow lamps, max. effic. Howell, abs. *Inst C E* v 93 -**88**, *El Eng* ; and arc, probs. in the physics of, Fleming *Sc Am Sup* \* Aug 23-**90** ; data and testing, Puffer (full) *Tech Q* \* Feb, insets \* May -**90** ; candle power relative to voltage, Ferguson, insets \* July -**91**

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*El Rev Lond* Fontaine, Sep 27-**89** ; standard specs. July 4 ; sanitary aspects, Preece, Aug 29 ; in its relation to the consumer, Naylor, Dec 5-**90** ; mains, Preece, May 22 ; nine years' record, Bd. of Trade report, Aug 14-**91** ; English stats., table, Jan 8 ; figures, Booth \* Apr 1, 8, 22 \* May 27, June 17 -**92**

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ACCESSORIES, English and Am. differences, Bathurst *El Wld* July 26-**90**

ANNAPOLIS, Md. station *El Wld* \* July 27-**89**

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ARC, Westinghouse alt. system *El Eng* \* Apr 2; cost, various towns and cities, Rosewater, 9-**90**; use of arc in, E. Thomson (full) \* Feb 25; rates, various cities, Apr 1-**91**, cost do. *El Rev Lond* Dec 13-**89**; E. Thomson, Mar 20 \* 27, Apr 3-**91**; cost from small power stations, Sep 30-**92**; cost various (38) Am. cities, table *El Rev* Mar 26-**92**; the Huntington arc projector *El Wld* \* Dec 7-**89**; station, St. Louis (largest in world) report (full) Jan 3; use of arc in, E. Thomson (full) \* Feb 28; 'Munic.' St. Louis system, Ayer, Sep 19-**91**; Westinghouse system, abs. *Inst C E* v 101-**90** \* *El Eng N. Y.* -**90**; cost, various cities *Sc Am Sup* Dec 14-**89**

ASHTON Court station, England *The Eng* \* Dec 11, 11-**91**

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**Electric** LIGHTING, EIFFEL tower plant *Eng* \* June 21, (full) *Sc Am Sup* \* July 27-**89**

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FERRANTI system, Haskins *El Eng* Feb 25, *El Wld* Feb 28 -**91**

FRANKFORT-on-Main *El Rev Lond* Feb 28 \* Mar 7-21-**90** ; exhib. May 29-**91** ; report, abs. *Inst C E* v 100 -**90**, *Elek Zeit* v 5 -**90** ; station, Miller report *The Eng* \* Sep 30-**92**

GENEVA, Chavannes, abs. *Inst C E* v 95 -**89**, *Lum Elec* v 29 -**88**

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INCANDESCENT stations, independent engines for, Church *El Rev Lond* \* Apr 13-**88** ; prog. Böhm \* Oct 9, 16, (full) *El Wld* \* Sep 12-**91** ; Ottawa, Ill. Valley plant, long dist., map *E News* \* Oct 5-**89** ; carbon filaments, Fitz-Gerald, n *The Eng* May 18-**88** ; Adelphi theatre plant, Edison-Swan Co. \* Jan 25-**89**. See also ELEC. lighting, London, etc. — stations

KESWICK water-power station, Fawcus *Eng* May 30, and discuss., inset *Inst C E* \* v 102 -**90**

LIVERPOOL stations *El Rev Lond* Jan 30-**91** ; license *E Rec* Sep 22, Oct 13, 27-**88**

LONDON *El Rev Lond* May, June 14, schemes, July, Aug -**89** ; prog., Bailey (full) Dec 19-**90** ; Elec. Supply Corp. report. Apr 1-**92** ; prog., Bailey *El Wld* Jan 10-**91** ; ed. *Eng* May 24-**89** ; Pruden. Assur. Co. offices station \* Feb 14-**90** ; Naval exhib. \* Nov 27 \* Dec 11-25-**91** \* Jan 1, 8-**92** ; Lond. Supply Corp., Deptford *E & Min* Nov 10-**88** ; *E News* July 4-**91** ; Lond. Cen. station, Gilley *Soc Arts Mass* -**90**

*The Eng* Deptford incand. station, Lond. Elec. Supply Co. Oct 26-**88** \* Apr 5, 12 \* May 31 ; Kensington incand. station. House to House Elec. Sup. Co. \* Feb 8-**89** ; \* Sep 5, 12 \* Oct 24 \* Nov 7 \* Dec 5, 12, 26-**90** ; Met. Sup. Co., map \* Jan 16, 16 \* 23 \* Mar 6, Scotland Yard \* May 8-**91** ; St.

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- Pancras station, Regent's Park \* Feb 19, 26; Notting Hill \* Apr 15; Westminster Sup. Co. \* May 13; \* Sep 9-**92**
- LOOMIS system *E News* \* May 18-**89**
- LOWELL light and power station, Shaw *El Eng* \* Jan 14-**91**
- MASSACHUSETTS statistics *El Wld* Mar 26-**92**
- MELBOURNE exhibition, Murray *El Rev Lond* Nov 15-**89**
- MOLDINGS, inset *El Eng* \* Sep 10-**90**
- MOTORS, trials *El Rev Lond* Feb 22, report *Eng* \* Feb 22 \* Mar 1-15, *F Inst* May -**89**, *J Soc Arts*
- MUNICIPAL, Francisco *El Rev* Aug 30, *El Wld* Aug 30-**90**; Bangor, Me., plant. Brush, June 29-**89**; St. Louis 'Munic.' arc system, Ayer (full) Sep 19; by munic. authorities, H. Robinson *E News* Sep 12-**91**
- NATICK, Mass., station *El Eng* \* Aug 6-**90**
- NEWCASTLE-on-Tyne Elec. Sup. Co. station, Heaviside *El Rev Lond* Oct 28-**92**
- NEW YORK City, Edison 26th st. station, (full) *El Wld* \* Jan 19-**89**; Madison Sq. Garden, Sullivan \* Nov 14-**91**; \* Jan 2-**92**
- OXFORD station (full) *El Rev Lond* \* July 8, *The Eng* \* July 1-**92**
- PARIS, exhib. '89 *El Rev Lond* Mar 29-**89**, Mar 21, 28, Apr 4, May 16, 23, 30-**90**; Sector of Place Clichy works \* May \* June 5-**91**; exhib., Heister system *El Wld* \* Aug 24-**89**
- Eng* Palais Royal Edison station \* Mar 8; exhib. \* May 3, portable military plant, July 19, Oerlikon plant, 26, \* Nov 15, 22-**89**
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- PHILADELPHIA, Edison station *El Eng* \* Oct 8-**90**, *Pwr* \* May -**89**
- PORTABLE plant *Eng* \* Feb 10-**88**; light port. military, Paris exhib. July 19-**89**, do. Charlesworth *Sci Am* Nov 17-**88**, do. ap., Suez canal *The Eng* Oct 12-**88**

**Electric** LIGHTING, PROVIDENCE, R. I., Narragansett Co. station  
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*El Eng* Dec 28-92; station, safety *El Rev Lond* Jan 11-89; acts 1882 and 1888, Jan 10; (full) Oct 17-90; rules for work, Benjamin *El Rev* May 10; and motive power, for install. of, Boston Manuf'rs Mut. Ins. Co. Aug 23, do. *E News* Aug 9; ins. rules, com. report *El Rev* Aug 30, Sep 27, Jenks, 27, N. E. Ins. Exchange, Nov 8-90, do. *El Wld* Apr 21-88; rules, com. report, Sep 19-91; rules, for safe install. *E News* Aug 9-90, Oct 3-91; rules for *E Rec* Aug 16-90. See also ELEC. insurance regs.

ROPE gear for elec. light work, Booth, Lea *El Rev Lond* June 26-91

RULES. See ELECTRIC lighting regulations

SAFETY devices E. Thomson *El Eng* Mar, *El Wld* Feb 22-90; station safety regs. *El Rev Lond* Jan 11-89. See also ELEC. lighting regs.

ST. Brieux *El Wld* \* May 16-91, *El Rev Lond*

ST. Catherine's Point light-house, most powerful light in world  
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ST. Louis 'Munic.' arc system and station (largest in world) *El Rev Lond* Jan 16, report (full) *El Wld* Jan 3, Ayer (full) Sep 19-91

ST. Paul Gas Co. station *El Wld* \* Feb 23-89

SALEM, Mass., T-H station *El Rev* \* June 15, (plans) *El Wld* \* June 15-89 \* Mar 15-90 \* Feb 14-91

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SPOKANE Falls station *El Wld* \* Sep 13-90

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*El Rev* construction, Woodbury \* Feb 22: econom. steam gen., Babcock, Mar 1: accounts system, T. C. Smith, Mar 1: insurance, Barton, May 31, July 19-**90**; building, Berlin Iron Bridge Co. \* Jan 10: steam distrib. from, Prentiss \* Feb 28: accounts, uniformity in method, Burleigh, sup. Sep 19: cen., op. by water power, Redman, 19: how to get paying loads for, Marks, Nov 21-**91**; and power, Mackie, July 23, 30, Aug 13, 20, Sep 10-24, Oct 8, Nov 5, 12-**92**

*El Wld* accounts, T. C. Smith, Feb 22: Woodbury \* 22: value of details in, DeCamp, Aug 30: as an investment, Sunny, Oct 25-**90**; steam distrib. from, Prentiss \* Feb 28: uniformity in accounts, Burleigh, Sep 19: op. by water power, Redman, 19: how to get paying loads for, Marks, Nov 21-**91**; the lamp, manager and customer, Roberts \* Mar 19: load curves \* Feb 27-**92**, \* *Electrician Lond*

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TOPEKA, Kan., Kingman, discuss. *Am C E* v 26-**92**

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WASHINGTON, U. S. Navy Yard, Brush arc station, Wilkes *El Eng* \* May 21-**90**

WESTINGHOUSE alt. arc system *El Eng* \* Apr 2-**90**; (full) *El Rev* and sup. \* Oct 27, alt. stations (list) Nov 10-**88**; *Eng* \* Feb 8, 22 \* Mar 15-**89**; abs. *Inst C E* v 101-**90**

**Electric LIGHTING**, WESTMINSTER Elec. Light Co. station *El Rev Lond* \* Mar 18-**92**

WIRING leads cal., graphic method, Hering *El Eng* \* May 27-**91**. See also ELEC. wires

WORCESTER, Mass. station, Shaw *El Eng* \* Dec 10-**90**

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MACHINES, Wilmhurst influence. Darke, cor. *Eng* \* Feb 14-**90**, theory, Pellissier *Sc Am Sup* \* Nov 14-**91**. See also ELEC. influence machine; DYNAMOS: ELEC. motors

MAGNETIC susceptibilities of various iron and steel, Niegbaur *El Eng* \* Feb -**90**; reluctance, Kennelly (full) \* Nov 4-**91**; propagation, E. Thomson, Wightmann *El Rev Lond* \* Oct 26, do. *El Wld* \* Oct 27-**88**; screening, variational, W. Thomson \* May 9, do. *El Rev Lond* May 1-**91**; leakage, Ives \* Jan 22, 29; balance, Du Bois \* Sep 2, do. *El Wld* \* Sep 24-**92**; non-magnetic balances and alloys, Haswell, Webb *El Rev* June 23-**88**; field, change of form affecting, Dolbear, Mar 21-**91**; permeabilities of irons, Thompson \* July 2-**92**; call and integr. graph, the Abdank *El Wld* \* Nov 24-**88**; Eickemeyer's gauge \* Nov 9-**89**; mag. circuit notes, Steinmetz, June 4; permeabil. of special irons, M. E. Thompson \* 25; viscosity expts., Hopkinson \* Oct 1-**92**; field, early conception, Houston *F Inst* Mar -**92**; circuit, theory, Collins *Tech Q* \* May -**89**

MAGNETO-motive force and mag. formulas, Emery (full) *El Rev* \* Aug 27 \* Sep 3-**92**

MAGNETS, permanent, character of steel used for, Preece (full) *El Rev Lond* \* Sep 12-**90**

MAGNETISM, relation to induced elec. mo. force and cur. E. Thomson (full) *El Wld* \* June 1, *El Eng* \* June -**89**; Hopkinson \* Apr 9-30-**90**; twisting, Balch \* Sep 14-**92**; in watches, Giles *El Rev Lond* \* Oct 26, Gribi *El Rev* June 9, (full) *El Wld* \* June 30-**88**; induced, Ewing \* Oct 4, 11, *El Rev Lond* \* Oct 3-**90**. See also MAGNETISM

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MEASUREMENTS, W. Thomson's instrums., Fleming *El Wld* \* Feb 25, *El Eng* \* May -88, by Weston high resist. voltmeter, Loomis \* Dec 24-90, *El Rev Lond* \* Jan 9-91; measuring ap. standardizing, Berlin, Aug 9-89; Anthony *El Rev* Jan 21; methods, Liebig, sup. Sep 8-88; wiping contact methods for cur. and poten., Thomas \* July 30, *El Wld* \* July 2 -92; volta-metric of alt. curs., Kennelly \* Nov 3; in a house to house supply, Lowrie \* 17-88; units and measures, Internat. conference, Paris (full) Sep 21-89; applics. of Weston voltmeters and ammeters, Maschke (full) \* Mar 26 \* Apr 2-23-92; Lowrie *Eng* Oct 5-88; Webb *E Mag* Oct; instrums., Swinburne *E News* Sep 15-29, (full) *Inst C E* \* v 110-92, *The Eng* \* May 6-92; as applied to commercial work, Anthony *F Inst* Jan -88; constant shunt method for large contin. curs., Pike \* June -92; resist., Bauer *Pwr* \* Mar -92

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*El Rev Lond* Geyer-Bristol, for direct and alt. curs. \* Dec 21, 28-88; Edison chem., Jenks, Jan 11 \* 25, Feb 1, 8; for central stations, Forbes, Feb 1, 8; Cardew recording \* Nov 15-89; com. report, Mar 28; Blathy alt. cur. \* June 20; Thomson's \* Aug 15; W. Thomson's \* Oct 10; Mares' energy \* Nov 7; Shand, Dec 5-90; Meylan-Rich. energy \* Feb 13; Fer-ranti's \* Mar 20; Frere's \* 20-91; Brillie energy \* Apr 29; Scott's \* Dec 16, *The Eng* \* Dec 16-92

*El Rev* for central stations, Forbes, Feb 16; the Slattery \* Oct 12-89; Edison electrolytic, Kennelly \* Oct 4-90; Wal-ker, May 30, discuss. June 13-91

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*El Wld* Shallenberger's alt. cur. \* Sep 15; Geyer-Bristol, for direct and alt. curs. \* Nov 24; Reckenzaun & Pentz's \* Dec 29-**88**; Edison chem., Jenks (full) \* Jan 5; Nipkow's alt. cur. ammeter \* Mar 9; E. Thomson's oscillating \* May 4; the Walker \* July 20; the Manwaren \* Dec 7-**89**; the Walker \* Apr 12, May 30, discuss. June 13; Shand, Nov 22-**90**; Perry's elec. supply \* July 11-**91**

*Inst C E* for recording consumpt. of elec. energy, Wordingham, insets (full) \* v 108-**92**; Mares' energy, Juppout, abs. v 103-**91**. *Genie Civil* \* 17-**90**; Hobart *Pwr* \* June-Sep -**89**; the Wood ammeter *Sc Am Sup* \* Jan 14-**88**; radiation meter, Gregory \* Dec 14-**89**; \* Jan 25-**90**; the Frager *The Eng* \* May 29; the Teague \* June 19-**91**. See also **ELEC.** ammeters—ohm—secoh—tele—volt—watt meters

**MINING** machinery, Atkinson *Eng* Feb 13, *E News* \* Aug 8; energy transmiss.. Leonard and ed. \* May 16, Edison elec. percuss. drill, 16; Aspen Min. & Smelting Co. \* Oct 10-**91**

**MOLDINGS**, standard for elec. work *El Rev* \* Nov 15-**90**

**MOTIVE** force, thermo-chem. relation to, Siebel *El Eng* July 9-**90**, relations to atomic wt., chem. heat, etc., Gore, *El Rev Lond* June 12-**91**, general relation to equiv. vol., Gore, June 3-24-**92**, constant with variable speed, Hoho *El Wld* \* Jan 25-**90**, equation, for resist. and self-induc. circuit, Bedell (full) May 14-28, June 4-**92**; properties of the human heart, Waller \* Nov 3, *Sc Am Sup* \* Nov 24-**88**, *El Rev*; power, Thorenberg plant *Sci Am* Dec 1-**88**

**MOTORS**, *Am C E* comparative tests and st. locom.. Manhattan eleva. R., Moss, and discuss., insets \* v 23 -**90**

*El Eng* alt. cur., Duncan (full) \* Mar, Mar; Liebig, Mar; designing, Walker, May; 2 h.p. Sprague, expts.. Cox \* June \* Aug; alt. cur. and transformers, new system, Tesla (full) \* June, June, Swinburne, Sep; service charges basis, Lufkin, Sep -**88**  
*El Eng* diags., Clarke \* Jan; regulation, Crocker \* June; and dynamos, Perret \* Aug; speed regulation, Deprez on, Paget \* Aug; alt. cur. evolution, Patten \* Oct -**89**

*El Eng* Swinburne's alt. cur. \* Apr 16; Tesla's alt. \* Aug 6; rates basis, Lufkin \* 27; Tesla's new alt. Sep. 24; building, Short elec R. system \* Oct 15; Bradley's alt. \* Nov. 5, self-exciting \* 12; windings, Serrell, Dec 10; Riker low speed multipolar contin. cur. \* 17-**90**

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*El Eng* inventors of (Thomas Davenport) Pope (full) \* Jan 7-28 \* Feb 4; Patten's alt. \* Mar 4 \* May 13; alt. cur. design, Weston \* Apr 1; perfection of stationary, Crocker \* May 27; alt. cur., Hospitalier, Aug 26; op. at any speed or torque, with max effic., Leonard \* Nov 25; law of max. effic., Mailloux, Dec 9; polyphasal generators, Pupin \* 23-**91**

*El Eng* the Perret (full) \* Jan 6; law of effic., Mailloux, Jan 13; alt. cur., Stanley \* Mar 2; gearless, Short \* Apr 13; Excelsior, Muldaur \* Sep 14; Lundell fan \* Dec 7-**92**

*El Rev Lond* simple \* Apr 13; alt. cur., Tesla's new system \* June 15. ed. 22 \* 22-**88**; design, Snell, Feb 1; speed reg., Deprez, Apr 26. *Compt r*; regulation, Crocker *El Rev Lond* \* June 14; alt. cur., evolution of new type, Patten (full) \* Oct 11-**89**; armature reactions, theory, Swinburne \* Feb 14, 21, Mar 28, Apr 4; op. with high tension curs., Sperry \* Feb 21, 28; design, Esson \* 28 \* Mar 7. 14; Tesla's alt. \* Aug 22, Oct 3-**90**; alt. cur. design, Weston \* Apr 17; Hutin & Leblanc's alt. cur. \* July 24; Edison's \* Aug 21-**91**; leakage, Ives \* Jan 22. 29-**92**

*El Rev* Liebig, Feb 25; alt. cur. and transformers, new system, Tesla \* June 2, 9, Weyde \* July 14; service charges basis, Lufkin, Sep 22-**88**; Bradley alt. cur. imps. \* June 22; alt. cur. Patten \* Sep 28-**89**; armature reactions, theory, Swinburne \* Mar 15; imps. do. \* Apr 19; Tesla's alt. cur. pats. \* Aug 16; rates basis, Lufkin \* 30-**90**; Eikemeyer's novel \* Mar 28; Edison small slow speed \* May 30; the perfection of stationary, Crocker \* June 6; alt. cur., Hospitalier, Sep 12; Bradley's alt. cur. \* Oct 2; perfect. Everett, 31; aut. op. at any speed or torque, Leonard \* Nov 28-**91**; alt. cur., Stanley \* Mar 12; Ryan series reg. test, Bliss, Dec 31-**92**, *Sib J Eng*

*El Wld* the Patten \* Jan 7; effic. tests, Crane \* Feb 4; alt. cur., Duncan (full) \* 25; Liebig, Mar 3; reg., priority of invention, Sprague \* Apr 7, 14; cal. and designing, Crocker \* 28; alt. cur. and transformers, new system, Tesla \* June 2; the Lugo \* July 14; service charges, basis for cal., Lufkin \* Sep 8; designing, Owens \* Nov 17-**88**

*El Wld* alt. cur., Tesla, May 25; reg., Crocker (full) \* June 1, discuss. \* 8; the Perret \* Feb 2, July 6 \* Aug 3; alt. cur., ev. of new type, Patten (full) \* Sep 28; Industries' prize, n \* Dec 7; new prin. of constructing, Mailloux \* 28-**89**

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*El Wld* relation to elec. lighting Co's. Fitzgerald \* Feb 1; op. with high tension curs., Sperry, 15; design, Esson (full) \* Mar 22, 29 \* Apr 5, 12; the Zipernowsky-Deri-Blathy synchronous \* Mar 29; Perret multipolar \* July 26; alt. cur., new types \* Aug 16; Van Depoele induction \* 16; rates basis, Lufkin, diags. \* 30-90

*El Wld* work of Dow, in torpedo service, Apr 18; alt. cur., Duncan \* May 9, 16; perfection of stationary, Crocker \* May 30, discuss. June 6; alt. cur., Hospitalier \* Aug 29; Frankfort-Lauffen three-phase. Hering (full) \* Oct 31 \* Nov 7; aut. op. at any speed or torque, with max. effic., Leonard \* Nov 28-91

*El Wld* magnetic leakage, Ives (full) \* Jan 2; alt. cur., Stanley (full) \* Mar 5; alt. cur. self starting and exciting synchronous, Patten \* Apr 2; cal; Bedell, diag. \* 30-92

*Eng* alt. cur., ed. Nov 20; the Short gearless *E News* \* Sep 5-91; in workshops, Jenkin *Inst C E* \* v 102-90; small, effic., Clifford, abs. v 91-88, *Am Acad Arts & Sci* v 22-87; *E Rev* \* Nov -90; cal., Bedell, inset *F Inst* \* June -92

*Pwr* the Baxter \* Dec -88; Thomson's \* Jan; reciprocating \* Feb -89; Simple \* Jan -90; (various) \* Jan -92, *Elec Industries*; (growth of business) *Pope R & Eng* Sep -89

*Sc Am Sup* the Menges thermo-mag. generator \* Feb 18; simple, making, Hopkins \* Apr 14; charges, basis for cal., Lufkin, Sep 22, Nov 3-88; the Tesla \* Apr 6-89; home made, Parkhurst \* Aug 2-90; small, Hopkins \* Jan 3-91

*St R J* building, Short R. Co. \* Oct -90; max. effic. conditions, Leonard, Mailloux, Jan-92; small, effic., Clifford *Tech Q* Sep -87, Feb 89; small, comparative working expenses of, Korte *The Eng* Jan 22-92, *Zeit deut Ing* -91. See also DYNAMOS; ELEC. generators; RAILROADS, elec. motors

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OHM'S law, extension of elec. mo. force and Oudin *El Eng* Dec 30-91; expt. proof, Mayer \* July 9, *El Rev Lond* Aug 1-90; units, the volt, ohm and ampere, Nipher \* Apr 27, ohm det., Wuilleumier, July 13-88, suggestions, J. V. Jones (full) Sep 12; the Evershed *El Wld* \* Jan 11-90; alt. cur., Swinburne \* Dec 19-91; units, ohm, Glazebrook, Jones *Eng* Sep 26-90, new det. of *Sc Am Sup* \* Feb 16-89; law and electro-therapeutics, Winton, July 26, expt. proof, Mayer \* Aug 2-90, *Am J. Sci.* See also ELEC. units

- Electric** OMNIBUS, London *Sc Am Sup* \* Mar 2-**89**, *El Eng*  
 ORE-dressing, Tilly Foster mine, McDowell *E News* Oct 4-**90**  
 ORGAN, control, Hope-Jones *El Rev Lond* Jan 15-**92**; Wacker's  
 action *El Wld* \* Nov 23-**89**; organs, Swinburne \* July 4-**91**  
 OSCILLATIONS, Hertz's researches, Tunzelmann *El Eng* Feb \*  
 Apr, May \* July \* Aug. Joubert \* Oct -**89**; in air, Trowbridge  
*El Rev Lond* Oct 17. (full) *El Rev* \* Dec 6-**90**  
 PARCEL exchange system, Bennett *El Rev Lond* \* Sep 4, *Eng* \*  
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 PORTELECTRIC Co's transport. system, N. E. *El Eng* \* May 27,  
 Pope report *El Rev Lond* June 5 *El Rev* \* May 30-**91**, do.  
*El Wld* May 23-**91**, carrier \* Oct 10-**90**  
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**90**; comparative cost, effic. of large and small motors,  
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 2, 9-**91**; Edison works, Schenectady, N. Y., Martin (full) \* Feb  
 3; plant at Chic. World's fair, Collins \* Mar 23-**92**; distrib.  
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*El Wld* measurement by voltmeter, Swinburne \* Apr 18;  
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 10, 24; gen. at coal-fields and transmiss. to industrial centers,  
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*Eng* econom. limit of large units, Church, Jan 8; altruistic  
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Allen *E News* \* Nov 1-**90**; distrib., Spaulding *Pwr* \* Dec -**91**, *Am M E*, *Sc Am Sup* Jan 16; gen. in coal-fields, Thwaite *The Eng* Dec 2-**92**. See also ELEC. motors; RAILROADS, elec. power stations

POWER Transmission, *Am Min* present status. Rothwell v 17 -**89**; in mining operations, Spaulding, insets (full) \* v 19 -**91**

*El Eng* (energy) \* Feb -**88**, *Industries*; Kapp *El Eng* Mar 25; at very high potens. \* Apr 8; Leonard (full) Sep 2-**91**; long dist., Hart \* Jan 13; high poten., E. Thomson, Mar 23; long dist., Scott \* June 15-**92**

*El Rev Lond* Sprague, Mar 22 \* 29, May 10; long dist., from over compounded gens., Serrell \* Dec 6-**89**; Kapp. tables, Feb 20, Mar 6, (full) July 17 \* Aug 7-28-**91**; Frankfort plan, Hering, Apr 8; multiphase and distrib., Reckenzaun, Apr 29 \* May 13, June 24; long dist., Thwaite, Dec 16-**92**

*El Rev* Roberts \* Aug 31-**89**; Kapp (full) Aug 8; long dist., Frankfort, alt. curs. differing in phase (rotary curs.), Dolivo-Dobrowolsky \* Sep 19; Lauffen-Frankfort, Kapp \* Oct 10-**91**; long dist., Hart \* Jan 16; high poten., E. Thomson, Mar 26; long dist., Scott \* June 25; by alt. curs., Kapp \* Sep 17; future, Oct 15-**92**, *Industries*; *Electrician Lond*

*El Wld* long dist. calcs., Serrell, table, May 25; Roberts \* Aug 17; long dist., from over-compounded gens., Serrell \* Nov 16-**89**; Mar 14; high pressure, at Oerlikon, May \* Apr 18; Lauffen-Frankfort plant, Hering (full) \* Sep 26 \* Oct 31 \* Nov 7; by alt. curs., Dolivo-Dob. \* Oct 10-**91**

*El Wld* Lauffen-Frankfort tests, Hering, Jan 9, discuss. (full) Mar 5, effc. \* July 2; diags., Schlesinger \* Mar 5; Bell, 19; high poten., E. Thomson, 26; multiphase, Reckenzaun, May 21, June 11, July 23; long dist., Scott (full) \* June 18; effect of harmonics on alt. cur., Rowland, Dec 10; gen. at the coal-fields and transmiss. to industrial centers, Thwaite \* 31-**92**

*Eng* ed. Feb 20, 27, Mar 6-**91**; cost, Mansfield, n *E & Min* June 23-**88**; Rothwell, Jan 5-**89**; in the west, July 23-**92**, *El Eng*; Nevada mill *E News* Apr 12-**90**; alt. curs. for \* Aug 22-**91**; Hering, Mar 19-**92**; Sprague *F Inst* \* Mar-**89**; Lauffen-Frankfort, table, Aug; Griffin (full) Sep -**92**; by alt. curs., Stort abs. *Inst C E* v 106 -**91**; cost, Lahmeyer, v 109 -**92**, *Elek Zeit* -**91-92**; Geipel *Inst M E* Feb -**88**

*Pwr* long dist., Hart, Feb. Jackson, Apr. high poten., E.

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Thomson, May; Griffin \* Oct -92; Morris *R & Eng* May -92; \* Oct -90, *Genie Civil*; Sprague (full) *Sc Am Sup* \* July 20, 27 \* Aug 3-89; \* Mar 3-88, *Industries*; long dist., Hart *Tech Q* \* Apr -92; Kriegstettin to Solothurn, expts. *The Eng* Apr 13-88; West, Jan 16; Lauffen-Frankfort install. \* Oct 2, 9, oerlikon alternator \* 23-91. See also RAILROADS, elec. power stations

PROJECTILES, elec. welded, Maxim *Cassier's* \* Oct, *El Rev* Aug 6-92

PUMPS, pumping in collieries, Brain *El Eng* Jan -88; Dittman's vac. *El Wld* \* June 4-92; Hall's pumping plant *E News* May 5-88 \* Mar 15-90; three-cyl. elec., Gould Mfg Co. \* Nov 14 -91

RAILROADS, elec. working of, W. E. Hall *E News* July 12, limitations of steam and electricity in transport. 12-90. See also RAILROADS, elec.

RECORDING instrums., Holden, Drake and Gorham's *El Rev Lond* \* Sep 30-92

REGISTER, Ongley *El Rev* \* Jan 31-91

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RESISTANCE, *El Eng* compensated standards, Nichols \* June -88; specific, of paper \* June; of elec. light installs., Jamieson, Oct -89; specific, of metals and alloys, Prescott, Apr 30, May 7; inductive det., Steinmetz, Oct 29, Nov 5-90; insul., measuring, Patterson \* May 20; of copper, standard for, Holman, Nov 18; compensating, for galv. shunts, Frey \* Dec 23-91; standards, Willyoung, June 1; insul., of cotton and silk covered wires, Luquee \* Dec 28-92

*El Rev Lond* compensated standards, Nichols, Aug 10-88; insul., of elec. lighting station, Jamieson, Jan 25; standard, design, Fleming \* Feb 1-89; of mercury, Glazebrook, Sep 19; spec., of copper, Fitzpatrick (full) 26; of metals, Le Chatelier \* Oct 17; wire standard resists. Dec 26-90; human body, value of diminished, Cardew, Mar 13; of conductors, measurement, Appleyard \* Dec 18-91; of pure metals, alloys, Nov 11-92; of mercury, det., Glazebrook *El Rev* \* Oct 18 -90

*El Wld* compensated standards, Nichols, June 9-88; of iron and its alloys at high temps. \* Apr 19; of mercury, det., Glazebrook, Oct 11; wire standard resists., com. report, Dec 6;

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*F Inst* Megohm, Davids. Apr -91; standards, manuf. and adjustment, Willyoung, Apr -92; of metals, steel, Le Chatelier, abs. *Inst C E* v 104 -91, *Compt r* v 111 -90, 112 -91; of pure metals alloys *Sc Am Sup* \* Dec 31-92. See also under ELEC. insulation

RETARDATION due to iron pipes, Preece *El Wld* May 21-92

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RULES, fire ins.. Hartwell (full) *El Rev Lond* Sep 12-90; right hand and other rules, Maycock \* Jan 15-92; elec. light ins. rules, England *El Rev* Jan 14-88. See also ELEC. insurance rules — lighting regs.

SAFETY devices, E. Thomson *El Rev Lond* Mar 14, *El Rev* Feb 22-90. See also ELEC. insurance

SCHISEOPHONE (flaws in metals) *El Eng* \* July 16-90

SCREENING, electrostatic, by gratings, etc., W. Thomson *El Rev Lond* Apr. 17; and magnetic, variational, do. *Sci Am Sup* \* May 16-91

SEARCH light, Hutchins *Cassier's* \* Dec, Knowles (full) *El Eng* \* July 27 \* Aug 3, 24-92

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SECRET service, individual telegraph call *R Gaz* \* Aug 28-91

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SHUNT, constant method, errors in, Puffer *El Rev Lond* May 11-88

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SMEETING and production of aluminum, Boby *Sc Am Sup* \* July 13-89. See also ALUMINUM

SNOW sweeper, General Elec. Co. *Sc Am Sup* \* Dec 31-92

SOLENOIDS, properties, S. P. Thompson *El Rev* Feb 21-92; variable action of two-coil, Aldrich *F Inst* \* Apr -92

SPARKS, nature, in elec. vibrations of Hertz, Bischoff *El Rev Lond* \* Sep 25, Oct 2-91; sparking, Serrell *El Wld* \* Nov 10-88

- Electric** STANDARDS, com. report *El Rev Lond* Sep 26, Oct 10-**90**; Oct 16, discuss. 30-**91**; Pellet report, Sep 13, 20, *El Wld* Sep 7-**89**; com. report, Sep 26-**91**; Brit. Assoc. Sep 3-**92**; com. report *El Rev* Oct 3-**91**, *The Eng* sup. Dec 9-**92**. See also ELEC units
- STOCKS, English, table *El Rev Lond* Dec 16-**92**; market *El Wld* Dec 6-27-**90**
- STORAGE, of the alt. cur., Foppl, abs. *Inst C E* v 102 -**90** \* *Elek Zeit* -**90**; storage batteries. See STORAGE bats.
- STORM phenomena *El Eng* \* Aug 24 -**92**
- STOVE, Giraud's thermo-elec., Hospitalier, abs. *Inst C E* v 105, 106 -**91**, *Genie Civil* \* v 19 -**91**, *Sc Am Sup* \* July 18 -**91**. See also ELEC. heating
- STRESS, optical demonstration of, Rücker *Eng* \* May 18, *Sc Am Sup* \* May 19-**88**
- SUBWAYS, N. Y. Bd. of Elec. Control, report *El Wld* Jan 12-**89**, Jan 25; practical working, Mayer, discuss. Mar 15-**90**; of N. Y. City *E News* Apr 21 \* May 5, 26; of Phila., cor. \* June 9-**88**; of N. Y. *Sci Am* Apr 20-**89**. See also ELEC. wires, underground
- SUGAR refining *E News* Sep 22-**88**
- SUPPLY, cost, Hopkinson *El Rev Lond* Nov 11-**92**. See also under ELEC. lighting
- SWITCH-boards, Manhattan Elec. L. Co. *El Rev* \* May 7; multiple, Baylis, July 9-**92**
- SWITCHES, designing, Offrell *El Wld* June 21-**90**; and switching *Pwr* \* June \* July -**91**
- TABULATING, Hollerith system, com. report *F Inst* \* Apr -**90**. See also CENSUS counting ap.
- TANNING *El Rev Lond* June 26 \* July 3, 10-**91**, *El Rev* June 14, hist. n *El Wld* Sep 27-**90**
- TELEMETER system *E News* Oct 5-**89**; Fiske's (marine dist. instrum.) Brylinski abs. *Inst C E* v 106 -**91** \* *An Telegr.* -**91**
- TERMS and phrases, Maycock *El Rev Lond* \* Mar 25-**92**; (list) *E Rec* June 2-**88**
- TESTING, Handbook of, Kempe, bk., Spon; of iron, Swinburne *El Wld* \* Sep 27-**90**; ap., construct. and use, Frey \* Jan 17-31 \* Feb 7-28 \* Mar 7, 14-**91**
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- TRACTION, de Coetlogon *E News* \* Aug 18-**88**; the Ries increaser (locomotive) \* Aug 9-**90**

**Electric** TRANSFER table, Sprague, Altoona, Pa. *El Wld* \* Apr 13: Fitchburg, Mass. \* Nov 16-**89**

TRANSFORMATION, alt. — direct cur., proposed system. Patten *El Wld* \* Feb 27 \* Mar 19-**92**

TRANSFORMERS *El Eng* alt. cur., Kapp, discuss. (full) \* Apr. Apr, new system, Tesla (full) \* June, and contin. cur. system. comparative value. Badt, July, Swinburne, Sep -**88**; Ryan, and discuss. (full) \* Jan, Jan; effic., Humphrey \* July 2-**90**; distrib., Swinburne \* Apr 1, 8; alt. cur., geomet. theory of, Steinmetz, June 3-24, July 1-29, Aug 5 - Dec 23-**91**; relation of size and effic., Stillwell, Mar 2-**92**

*El Rev Lond* alt. cur., Kapp (very full) \* Feb 17, distrib. by, Mackenzie \* 17, 24, Mar 2, 9, Crompton \* Apr 20, 27, May 25; new system, Tesla \* June 15, 22, ed. 22; distrib. by, Gutmann, Oct 26: (secondary generator) pats., Gaulard & Gibbs vs. Ferranti, July 13-**88**, Mar 8; Ryan \* Jan 17; reg. cur. or poten., E. Thomson's method \* Apr 26; hist., Wilking's, Gelyi, May 17, 24; losses due to hysteresis in, discuss., E. Thomson, Tesla, June 13; description, Swinburne (full) Sep 20; Picou, report, 20-**89**

*El Rev Lond* distrib., Swinburne, Feb 27, Mar 6, 20; effic., Stanley, Mar 6, 13-**91**; relation of size and effic., Stillwell, Apr 22; distrib. by alt. curs., Kennedy, 22, May 6 \* 20 \* 27; hist. of tension-reducing \* May 27; Perry, June 3; tests. Hopkinson report (full) \* July 1; effic. at different frequencies, Ayrton, Sumpner \* Sep 23, imps. \* 23; alt. cur., expts., Fleming (full) \* Dec 2-30; Ferranti (full) 30-**92**

*El Rev* new system, Tesla \* June 2-**88**; Ryan, Dec 28-**89**; effic., Humphrey (full) \* July 5-**90**; German cur. \* June 20-**91**; relation of size and effic., Stillwell, Mar 5; 17,500 watt, test report, diag. Oct 1-**92**

*El Wld* alt. cur., Kapp \* Mar 17, 24; contin. cur., Sellon \* May 5; new system, Tesla \* June 2; points in distrib. by Gutmann \* Oct 13-**88**

*El Wld* E. Thomson's method of reg. cur. or poten. in secondaries of \* Apr 13; Kapp regulating \* May 4; and Ganz alt. machine, Forbes \* 25; Picou, Sep 7; Paget's alt. cur. \* Nov 16; tests, Ryan (full) \* Dec 28; design of commercial, Swinburne, 28-**89** \* Jan 11, 25, Ryan, discuss. 11: effic., Humphrey (full) \* July 5; distrib. by, from cen. and eccen. stations, Ganz system, Fleming (full) 26 \* Aug 2-30, Sep 6 \* Oct 25 \*

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Nov 1-15, 29 \* Dec 6, 27-**90** \* Jan 10, 24, 31 \* Feb 14; mag. circuit of, closed or open, Evershed, Mar 21 \* 28 \* Apr 4, 18, 25 \* May 2, 9, 23 \* June 6; distrib., Swinburne \* Mar 21, 28 \* Apr 4, 11-**91**

*El Wld* relation of size and efflc., Stillwell, Mar 5; efflc., Dobrowolsky \* May 28; the Rowland, July 9; Westinghouse 6,500 watt, test, Hopkinson \* 16, 23; test of 17,500 watt Stanley, Ryan \* Oct 1; efflc. at different frequencies, Ayrton, Sumpner \* 8, 15; hysteresis measurement in, Evershed \* 15, 22; universal, Appolonj \* Dec 10; alt. cur. expts., Fleming \* 24-**92**

*Eng* pats., ed. Mar 8-**89**; interference with alt. curs., Ayrton, Mar 27-**91**; Haskin's, bk. n *E News* Sep 29-**92**; alt. cur., Kapp *The Eng* Feb 10-24-**88**; alt. cur., Fleming, bk. review, Aug 26-**92**

TREE felling machine *Sc Am Sup* \* Mar 2-**89**, *Industries*

UNDULATIONS, Hertz's expts., Bertolini *Eng* \* Dec 12-**90**. See also ELEC., Hertz's

UNITS, Crocker *El Eng* Dec 31-**90**; Brit. Assoc. Oct. 14-**91**; the volt, ohm and ampere, Nipher *El Rev Lond* \* Apr 27; ohm det., Wuilleumier, July 13; nomen. Dec 7-**88**; and standards, Pellet report, Sep 13, 20-**89**; com. report, Sep 26, Oct 10-**90**; of measurement, absolute, Moon, May 1; and standards, report, Oct 16, discuss. 30-**91**; nomen., Lodge, Aug 12-26-**92**; Crocker *El Rev* Jan 3; and standards, report, Oct 3-**91**

*El Wld* the volt, ohm and ampere, Nipher, Apr 7-**88**; standards, Pellet, Sep 7, and measures, Internat. Elec. Con., Paris (full) 21-**89**; of present and future, Crocker, Jan 3; Kimball (full) \* 17-31; and mag., absolute dimens., Rodgers, May 2; and standards, com. report, Sep 26-**91**; do. Brit. Assoc. Sep. 8-**92**

*Eng* ohm, Glazebrook, Jones, Sep 26-**90**; new det. of ohm *Sc Am Sup* \* Feb 16-**89**; of present and future, Crocker, Apr 11-**91**; (terms) *St R J* Oct-**89**; and mechan. *E & Min* Aug 9, *The Eng* July 4-**90**; electro-magnetic, Nov 27-**91**; standards, com. report, sup. Dec 9-**92**. See also ELEC. ampere — ohm — standards — volt — watt, etc.

VACUUM discharge streamers action, Pupin *El Eng* \* Apr 20-**92**; tube discharge, Tesla *El Wld?* June 10 \* July 1-**91**

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*El Rev Lond* portable, for measuring alt. poten. differences, Ayrton (full) \* Jan 13-27-88; Ayrton & Perry's hot wire \* Mar 8; spiral coil, Ryan \* June 28; W. Thomson's chain of electrostatic, Meikle \* Nov 8-29-89; Ayrton & Perry's twisted strip \* May 2-90; Sankey \* Nov 27, Dec 4-91; Weston's \* Jan 1-92

*El Wld* for measuring alt. poten. differences, Ayrton, Perry \* Jan 28, Feb 4, 11; portable, do. Mar 19; Weston's \* Nov 17-88 \* Feb 2; instrums. for measuring high potens. \* 9; Ayrton & Perry's \* Apr 6; spiral coil, Ryan \* June 1-89; Ayrton & P's twisted strip \* May 24-90; Weston, as a testing instrum., Merrill \* May 21-92; and ammeter combination, A. White (full) \* *Soc Arts Mass* -90

WATER conveyor, Bailey's, n *El Rev* \* Aug 2-90; purification, Stanley-Quackenboss pat. *E News* May 17-90

WATTMETERS, Thomson recording *El Eng* \* Nov 5-90 \* June 17-91; corrections to readings, Danielson *El Wld* \* Mar 5, do. Friese, do. May 21-92; for alt. curs., Ganz *Eng* \* Apr 5-89; abs. *Inst C E* v 94 -88, *Cen Elek* -88

WAVE and phase indicator, for alt. and undul. curs., E. Thomson *El Rev Lond* \* Feb 3-88; waves, mechan. actions, Hertz *El Wld* \* July 25-91; propagation through wires, Hertz \* Oct 12, *El Eng* Dec, (full) *Sc Am Sup* Oct 19-89

WEIGHING machine, the Snelgrove *El Rev Lond* \* Aug 16, *El Rev* Sep 7, *Eng* \* June 21-89

WELDING *Am M E* Woodbury v 10 -89; *Am Min* E. Thomson v 19-91; and metal working, Wood, v 20 -92; *Cassier's* welded projectiles, Maxim \* Oct -92

*El Eng* aut. machines, Lemp (full) \* June 4; E. Thomson, Oct 8-90; practical aspects, Perrine, May 27-91; *El Rev Lond* \* Jan 6; E. Thomson \* Nov 16-88; Benardos system, Jan 1-92; proc., Lodge on, Varley (full) July 18, *Industries* June 27-90

*El Rev* Woodbury, Oct 27, tests, table, Nov 3-88; aut. machines, Lemp (full) June 7; applied to manuf. of projectiles, Wood, Nov 1-90; practical aspects, Perrine, May 30, discuss. June 13; Okonite Co's plant \* Oct 24-91, welded projectiles. Maxim, Aug 6-92

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*El Wld* Benardos', by means of the arc \* Feb 25; tests, table, Dec 1-**88**; Thomson's \* Feb 9-**89**; aut. machines, Lemp (full) \* June 7; Coffin's incand., new method \* Sep 20; E. Thomson, Oct 11; in projectile manuf., Wood, Nov 15-**90**; pract. aspects, Perrine, May 30. E. Thomson, June 6-**91**; Benardos' system, by elec. arc \* Jan 16; in wire indus., Bullard, abs. Mar 12; and metal working, Royce, Nov 12-**92**

*Eng* Benardos' system \* Dec 25-**91**, do. St. Petersburg \* Jan 27; Thomson's \* Dec 14-**88**, do. Fish, Oct 4-**89**; *E Mag* Pope \* July -**91**; *E & Min* Thomson's, n \* Nov 17-**88** \* Feb 9; Howe's Metallurgy of Steel (bk.) sup. May 11-**89**; arc \* Sep 13; aut. machine, Lemp \* Nov 29-**90**

*E News* Benardos' method, Apr 7; proc. \* May 5-**88**; Thomson proc., expts. Mar 9, 23; fibrous structure of elec. welds \* Sep 14, 21-**89**; Fish, Jan 18; (full) \* Nov 15-**90**; pract. aspects, Perrine, June 6-**91**; *E Rec* Woodbury, Nov 17-**88**

*F Inst* Woodbury, Dec; Thomson \* Nov -**88**, Thom. Elec. Welding Co., U. S. Naval Bd. report, July; Thomson's, notes from Paris exhib., Hering, Sep -**90**; *Inst C E* applic. of electricity to welding, stamping and other cognate purposes. Bramwell, and discuss. (very full) \* v 102-**90**, pract. aspects, Perrine, abs. v 105-**91**, 107-**92**, *Am Inst Elec Engrs* -**91**; of metals *Locom* Nov -**88**; Benardos' method, Ruhlmann *R & Eng* \* Feb -**88**, *Electrician Lond*

*R Gaz* Woodbury, and discuss. abs. Nov. 2-**88**; wire cable, Stuart, Bullard, July 19; of rails, Ries, cor. Sep 27-**89**; of projectiles, Wood, Nov 7-**90**; cost, May 1; uses, Perrine, 29, E. Thomson, discuss. June 12-**91**; elec. blow-pipe, Sheldon *Sci Am* Feb 2-**89**

*Sc Am Sup* Benardos' \* Mar 3; applics., Stuart, July 21, Oct 20-**88**; Thomson's \* Jan 26-**89**; weldable by electricity (list) n Aug 16; prog. \* Sep 20; of projectiles, Wood, Nov 22, 29-**90**; Dewey \* Jan 17-**91**; Benardos-Howard proc. \* Feb 6-**92**; *Soc Arts Mass* of projectiles, Wood -**91**

*The Eng* Thomson's machines, Paris exhib. July 5-**89**; ed. Feb 21, cost, n 28; Bramwell, Apr 18; Woodbury, June 27; arc C. L. Coffin, n \* Sep 12; of projectiles, Wood, Dec 5-**90**; Benardos-Howard proc. \* Dec 25-**91**, machine \* Feb 26-**92**

**Electric WINDING** coils data, table, Wheeler, *El Eng* May -88; the Bell compound, for constant poten. *El Wld* \* Nov 29-90, do. abs. *Inst C E* v 103 -91, *El Eng* v 10 -90

**WINDLASS** *El Rev Lond* \* July 3-91

**WIRE** covering machine. Barraclough's *El Rev Lond* \* Mar 14-90

**WIRES** *El Eng* Brackett addr. Feb -89; tests, Paris exhib., Hering, May 14; Kerite insul. manuf. \* Nov 12; insul. and cables testing, Webb \* 19, 26 \* Dec 3-31-90 \* Jan 7-28 \* Feb 4-18 \* Mar 4-18; cop., temp. correction for, Hering, Jan 7; temp. coeffs. det. of german silver, Sheldon \* June 10-91; overhead construction, Peck \* Mar 2-92

*El Rev Lond* overhead vs. underground, Wheeler, Nov 2; sizes, table, 16; lead covered cables, ed. Dec 28-88; overhead (mechan. strains) S. Russell, Oct 24-90; *El Rev* Brackett addr. (full) Jan 12; disruptive discharges in lead cables, Rudd \* Mar 9-89

*El Wld* rules for overhead conductors, N. Y. Bd. Elec. Control, Dec 8-88; Cobb vulcanite manuf. \* Jan 5; Am. insul., tests, Wilkes (full) \* 26, Feb 9; disruption discharges in lead cables, Rudd \* Mar 2-89; insul., commercial measurement of, Hering \* Mar 7; large compounded, table, do. 28; cable testing, Fisher \* June 27 \* July 4-18-91; overhead construction, Peck \* Mar 5-92; do. vs. underground, Webb *E Mag* Aug -91; Johnson Interior Conduit and Insul. Co. system, com. report *F Inst* \* Mar -91

**UNDERGROUND** *El Eng* undergrounding of arc, Leggett, Mar; N. Y., Wheeler, Sep; disruptive discharges relation to, Acheson \* Sep -88; com. report, Mar -89; N. Y. subways practical working, Maver (full) Mar; high tension, English authorities on, Apr 2; Edison tubes system \* July 2-90

*El Rev Lond* system, Brooks \* Feb 3; N. Y. vs. overhead, Wheeler, Nov 2-88; District Columbia, U. S. Mar 22; Verity, Apr 26; N. Y., Bd. Elec. Control report, Jan 25, Wheeler, May 3-89; Brooklyn subways, com. report, Jan 24, 31, Feb 7-21-90; cables, S. A. Russell \* Mar 13, 20-91

*El Rev* arc light, Leggett, Mar 3, 3; N. Y. Bd. Elec. Control (full) July 28; disrupt. discharges relation to, Acheson, sup. \* Sep 8; and overhead, Wheeler \* 15-88; Brooklyn commission report, Jan 5; Johnstone conduit system \* Feb 23, 23; com. report, Mar 2; N. Y. arc, Wheeler, Apr 20-89;

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Brooklyn subways report (full) Jan 4-90; construction \* Mar 5-92

*El Wld* Brooks system \* Jan 21; disrupt. discharges relation to, Acheson \* Sep 8; and overhead, N. Y., Wheeler (full) 8-88; conduits, com. report, discuss. (full) Mar 2-89; N. Y. subways, Maver (full) \* Mar 1; Munsie-Coles conduit system \* June 14; Edison tubes system \* July 5; conduits, com. report, Aug 30-90; construct. and maintenance, Fowler, Sep 5-91; and discuss., Francisco, Mar 5; N. Y. city \* Apr 23-92

*Eng* Waring's cables \* Oct 19-88; Paris mains \* Jan 30 \* Feb 6-27-91; vs. overhead, Webb *E Mag* Aug -91; N. Y. subways *E News* Apr 21 \* May 5-26; Phila. June 9-88; Paris \* Jan 25-90; Washington, D. C., Elec. Commission report, Nov. 7-91; N. Y. Bd. Elec. Control report *E Rev* \* Jan 14-88; Europe *R & Eng* \* May -90; number in various cities *Sci Am* Dec 1-88; cables, W. Siemens (full) *Sc Am Sup* Aug 10-89; construct., Fowler, Sep 26-91

WIRING chart, Waring *El Eng* \* Oct 8-90; and ins. rules, N. E., com. report, Sep 16-91; of buildings, Andrews *El Rev Lond* Apr 5-89; Andrew's concentric system \* May 15-91; houses, Segundo, Jan 1 \* 8, 29-92; leads for, graph, method of cal., Hering *El Rev* \* May 30, do. *El Wld* \* May 30-91; of buildings, standard rules, Crockett, Apr 20; Colonnade hotel, Phila. May 11; Interior Elec. Conduit Co. system \* Nov 30-89; diag. for cal. length of wire *E News* July 11 \* Sep 12; safe rules, com. report *E Rev* Oct 10; kinks, Francis *Pwr* \* Aug; safe, Elec. Light Assoc. report (full) Oct -91; spec., Lond. *Sc Am Sup* Oct 13-88; of buildings, Andrews \* May 25-89, *El Eng Lond*

WORLD offices, N. Y. *El Wld* \* Jan 11-90

**Electricians**, eminent, facts, Weyde *El Rev* Nov 14-28, Dec 5, 19-91, Jan 16, 23-92; the electrician in war, Fiske *El Wld* Nov 1-90

**Electricity**, Modern, Kirwan, bk., Boston, 1889; and haulage, Pocock *Am Min* v 18 -90; *El Eng* Brit. Assoc. papers, Lodge, Nov -88; Paris exhibits, Hering \* May 14, 21 June 26; dangers, Morton, Aug 27-90; in transitu from plenum to vacuum, Crookes \* Feb 4-18-91; magneto-electric. discovery, America's part in, work of Farraday and Henry \* Jan 13, 20 \* Feb 3-17 \* Mar 9-92

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*El Rev Lond* in Gynæcology, Burton, Nov 1-**89**; ether and matter, Gray \* Feb 13, 27; in relation to human body, Lawrence, Mar 27, Apr 3-**91**, human body as a conductor of, do. Aug. 12, action of alt. curs. on, Korthals, Oct 14; for curative purposes, Aug, Sep, ed. 23-**92**

*El Rev* and light, identity of, Hertz, Dec 14-**89**; dangers of, Morton, Aug 30; in daily life, bk. review \* Dec 27-**90**; in transitu from plenum to vac., Crookes (full) \* Feb 14; history (Leyden jar), 150 years ago, Weyde \* Oct 17, 24 \* Nov 21 \* Dec 12-**91**; radiation of energy, Trouton, Mar 19; correlation of with heat, Preston, Apr 2; mod. views, Stanley, 16; what it is Jacques, May 21; medical, files Sep-Dec -**92**

*El Wld* thermo-electricity, Acheson \* Feb 25-**88**, do. Rust \* July 27 \* Aug 3, 10-**89**; dangers of, Morton, Aug 30; the electrician in war, Fiske, Nov 1-**90**; in transitu from plenum to vac., Crookes (full) \* Feb 7-21; as the rival of steam, Bell (full) Mar 14; electric., galvanism, magnetism and the telegraph, chronol. hist., Mottelay (very full) \* Apr 18- \* Oct 24, Nov 7 - Dec 26-**91**, Sep 3, pors. \* 10 - \* Oct 22 - Dec 31-**92**, etc.; elements of practical, Bell (full) \* Sep 5, 12, 26 \* Oct 3 - Dec 26-**91**; \* Jan 2 - \* Feb 20, Mar 12; Buffalo features, Hering (full) \* Feb 13; at World's Columb. exhib. Aug 20, 27, Sep 3, 17, Oct 8, 22 \* Nov 5, 26 \* Dec 24, 31-**92**

*Eng* as applied to eng., Geipel, Feb 17. 24-**88**; and gas, comparative cost, ed. July 10; chronol. hist. of, Mottelay, June 5, 12, 19, July 3, 17, 24, Aug 7, 14, 28, Oct 2, 16, Nov 13, Dec 11-25-**91**, Jan 8-22, Feb 5, 26, Mar 4-**92**; and gas, relative cost, Humphreys *E Mag* Nov -**92**

*E News* from water power, Belknap water motor and dynamo \* June 15; a decade of prog. in, July 27-**89**; heat production from, ed. Aug 9; dangers of, Morton, Sep 6; in warfare, Fiske \* 20, 27-**90**; as a mode of motion, Kropotkin \* June 30-**92**

*F Inst* mod. conceptions of, Duncan, Aug; in warfare, Fiske, Sep-**90**; its past, present and future, Pope, Jan; events, chronol. Feb; as the rival of steam, Bell, Mar -**91**; applics., lectures (bk.) *Inst C E* -**84**; as applied to eng., Geipel, and discuss., insets (full) *Inst M E* \* Feb -**88**; possibilities of, W. Crookes (suggestive) *Littell's* Apr 9-**92**, *Fortnightly Rev*; recent science, Kropotkin (nature) *19th Cent* May -**92**; lessons *Power* files \* Jan -**91** etc; latest discov., Gordon *R & Eng* June -**92**

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*Sc Am Sup* position and prospects as applied to eng., Geipel (full) Mar 10, 17; applics., Preece (full) Sep 29-**88**; light and heat, Brackett, Feb 2, 9; in the engine room \* Dec 14-**89**; in warfare, Fiske, Sep 20, 27-**90**; in transitu from plenum and vac., Crookes (full) \* Mar 7, 28-**91**; what it is, expts., Jacques, June 4; commercial, Spaulding *Tech Q* Apr -**92**. See also under ELEC. eng; ELECTRO-

**Electro-culture** (plants), report (full) *El Rev* \* Oct 17-**91**

**Electrocution**, of Kemmler, Talbot *El Rev* Apr 25-**91**; Heinrichs *Sc Am Sup* Aug 10-**89**. See also ELEC. execution

**Electro-deposition**, arr. of vats in, Mailloux *El Eng* Jan 14-28; Wilkes, Feb 11-**91**; of platinum, Wahl, July 16, *El Rev Lond* July 11, *El Wld* June 28-**90**

**Electro-dynamic machinery**, theoret. elements of, Kennelly *El Eng* \* July 6, 20 \* Aug 3, 31, Sep 7-**92**; actions, speed of diffusion, Hertz *El Rev Lond* Nov 9, 16-**88**; dynamics of stationary bodies, do. *El Wld* Sep 20, 27, Oct 18, 25, Nov 8, 15-**90**, *Electric Lond*; force produced by dielectric in elec. field, Röntgen, abs. *Inst C E* v 92-**88**, *Sitzung.Akad Berlin* -**88**; dynamics, new, Lowe *Sc Am Sup* \* Oct 12-**89**

**Electro-dynamometers**, for measuring alt. curs., Maneutrier, abs. *Inst C E* v 92-**88** *Compt r* v 106-**88**; for three-phase curs., Zickermann, abs. *Inst C E* v 108-**92**, *Elek Zeit* -**91**

**Electrograph** (meteorological) Warner *El Rev* \* Nov 22-**90**

**Electrolysis**, of iron salts, Watt *El Eng* Jan. Feb, Apr, June, July, Sep, tin salts, do. \* Oct - \* Dec -**88**; of cop. sulphate in standardizing elec. instrums., Meikle *El Rev Lond* \* Mar 23, 30; of lead salts, Watt, Apr 6, 13, 27, of tin salts, do. \* Sep 14, 28 \* Oct 5-**88**; commercial, Andreoli, Oct 28, Nov 4, do. *El Rev* Dec 3; commercial, Swinburne, Aug 20, 27, do. *El Wld* Sep 3-24-**92**, Andreoli, Nov 26-**91**, Dec 10, 17-**92**; by the alt. cur., Mengarini \* Aug 8-22; and actinism, Houston *F Inst* Dec -**91**; various substances *Sc Am Sup* \* Sep 6-**90**; of water, hydrogen and oxygen production, industrial voltameter \* Sep 12-**91**

**Electrolytes**, spec. inductive capac. expts., Rosa (full) *El Wld* \* Oct 8-**92**

**Electro-magnet**, S. P. Thompson (very full) *El Rev Lond* \* Sep 19 - \* Dec 26-**90**, Jan 2-**91**, fallacies, do. *El Rev* Dec 13, 20-**90**, types, Jan 24-**91**, do. (full) *El Wld* \* Aug 30 \* Sep 6, 27- \* Dec 6-20-**90**, do. (very full) *Sc Am Sup* \* Nov 22, 29 \* Dec

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6, 13, 20-**90** \* Jan 10-31 \* Feb 7, 14-**91** ; a big, *Locom* Jan -**88**, *E & Min* ; King's great *The Eng* Feb 10-**88**

**Electro-magnetic**, radiation, Fitzgerald *El Eng* \* July 16-**90** ; induction researches, Vignoles *El Rev Lond* \* May 29-**91** ; shunts, Moon, Jan 22 ; ampere-centimeter, a measure of electro-magnetism, Hering, July 29-**92** ; radiation, Kimball *El Rev* \* Dec 20, do. *El Wld* \* Nov 8, 15-**90** ; mechanisms, S. P. Thompson \* Jan 17, 24 \* Feb 21-**91** ; machinery, notes, Aldrich (full) \* Feb 13, 27 \* Mar 19 \* Apr 2, do. *F Inst* \* Feb \* Mar, do. *Pwr* \* Mar -**92** ; radiation, Fitzgerald *Sc Am Sup* \* Aug 30 ; separator, Hall, cor. *The Eng* \* July 18-**90**

**Electro-metallurgy**, Swan *El Rev Lond* Nov 25 ; Cazin *El Wld* \* Apr 30, May 7, 14, 28, June 4, July 23, 30, Aug 6-20, Sep 3-24 \* Oct 1-15-**92** ; metallurgical processes, consumption of energy in, Pouthiere, abs. *Inst C E* v 98 -**89**, *Lum Elec* v 33 -**89** ; Swan *Sc Am Sup* Oct 29-**92** ; machine, Lauffen-Neuhausen *The Eng* Oct 5-**88**

**Electrometer**, guard-ring, for contin. readings, Jaumann, abs. *Inst C E* v 92 -**88**, *Central Elek* -**87**

**Electro-motive** properties of the human heart, Waller *El Rev Lond* \* Oct 12-**88**

**Electro-motors**, governing, Ayrton, Perry *El Rev Lond* July 20-**88** ; 'Agir' prize motor *E & Min* \* Dec 7-**89** \* *Industries*.  
See also DYNAMOS ; ELEC. motors

**Electro-physiology**, D'Arsonval *El Wld* Oct 5, 12-**89**

**Electro-plating** dynamo, efficient, *El Rev Lond* \* May 1-**91**

**Electrostatic** screening by gratings, etc., W. Thomson *El Rev Lond* Apr 17 ; ratio to electro-mag. induction, expts., Kennelly, June 12 ; induction, Taylor \* July 31 \* Aug 7-**91** ; alternators, Muras \* June 17-**92**

**Electrotechnics**, Ayrton, Pres. addr. *El Rev Lond* Jan 29-**92**

**Elements** and meta-elements, Crookes *Sc Am Sup* May 5-**88**

**Elevated** railroads. See RAILROADS Elevated

**Elevators**, Weehawken and viaduct, T. E. Brown, insets *Am C E* \* v 27-**92** ; brake straps lining material, Leavitt, discuss. *Am M E* -**88** ; elec., and hoist *El Eng* \* Oct 29-**90** ; Sprague-Pratt elec. (full) \* Nov 2, do. *El Wld* \* Apr 2-**92** ; elec., and (dock hoist) \* Nov 1-**90** ; Otis elec. \* July 4-**91**

*Eng* Eureka safety hoist, n \* Nov 16-**88** ; Smith & Stevens', with safety gear \* Mar 1 ; Eiffel tower hydr. lifts. Otis', Roux,

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Ansaloni, etc. \* July 5-19; St. Lazare R. station, Paris, wagon hoists \* 12-89; City & So. Lond. R. hydr. hoists \* Dec 26-90; floating and spoil distributor, Baltic Sea canal, inset \* Feb 20; Otis Pass., No. Hudson Cty. R., Hoboken, inset \* May 22 \* June 5, do. inset *E News* \* Jan 17-91; pass., ed. Aug 10-89; Reno, continuous \* Aug 25; Sprague-Pratt elec. \* Nov 24-92

*E Rec* Eiffel tower lifts, Ansaloni, Aug 24 \* Sep 7-89, do. elec. helicoidal, Audra, abs. *Inst C E* v 94-88, \* *Genie Civil* \* v 13-88, do. insets *Inst M E* \* July-89; evolution of, Sheridan *E Rec* Jan 24-91, *J Assoc E Soc's*; Hall's hydro-steam, Hinchliffe, abs. *Inst C E* v 106-91, *Tech Soc Pac Coast* -91; Weehawken, T. E. Brown, inset *R Gaz* \* Jan 22; hydr., effc., Gale, Dec 30-92; Eiffel tower, Paris exhib., Nansouty *Sc Am Sup* \* Apr 27-89; floating and spoil distrib., Baltic Sea canal \* Mar 28-91

*The Eng* Stevens & Major's hydr. pass. lift, May 18; spiral elec., for Eiffel tower, Aug 3; Archer's hydr. balance, Columbus monument, Barcelona, Nov 23, 23-88; at Eiffel tower, Roux hydr. \* Mar 22, Otis, Edoux and Roux, July 19-89; for Eddy-stone light-house model, Naval exhib., Lond. \* Aug 21-91. See also CANAL lifts, Fontinettes; HYDR. lifts; RAILROADS, incline

**Ellipses**, the false, reduced by by equations of condition, Würtele *Am C E* \* v 24-91; spacing, Grant *F Inst* \* Apr-89; confocal, and applic. to mechanism, Gale \* Feb-91; drawing by arcs of circles, Honey *Sc Am Sup* \* July 5-90, and equiv. ovals of equal areas, do. \* May 9-91. See also CURVATURE; DRAWING

**Elswick** arsenal and shipyard, inset *Eng* \* Oct 18, 25 \* Nov 1-29, Dec 6-89

**Emery** wheels, Paret *F Inst* \* Mar -90; Am., 15 varieties, comparison, com. report, Nov -91; mounting *R & Eng* \* Feb; French and Am. practice, cor. Mar -89

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MC EWEN aut. *El Wld* \* Apr 16-92

MOTOR, an alleged new, Lautreppe *E News* Jan 7-88

NOBLE's vertical *The Eng* \* June 20-90

PHILADELPHIA Corliss *Pwr* \* Jan -92

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PORTABLE, with removable fire-box and tubes *Eng* \* May 10-89; semi-portable trip-expan. *E News* \* Aug 11-88; how erected *The Eng* \* Sep 11-91

PYLE aut. and dynamo (multiple cyl.) *El Wld* \* Aug 29-91

RIGG's high-speed revolving *The Eng* Jan 27-88

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SHIPMAN aut. *The Eng* July 27-88

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SPEED register, Duveau's *Eng* \* Sep 27, *Sc Am Sup* \* Nov 9-89; regulators, Marie abs. *Inst C E* v 93 -88 *An Mines* v 12 -87; speed and work, Thurston *Am M E* \* v 10 -89, expts. *R Gaz* \* Dec 28, (full) *Sc Am Sup* \* Oct 27 \* Nov 3-88; Corliss valves setting *Pwr* \* Mar -90 \* Nov -92; valves \* June -90; Child's piston *R & Eng* \* Jan -89; valves, Hawley *Sc Am Sup* \* Jan 31 \* Feb 14-91. See also ENGINES, governors — high-speed

STEAM jacket, authorities on, Thurston *Am M E* v 12 -91, do. Donkin *Inst C E* v 104 -91; influence of, Kent *Cassier's* \* Dec -91; Dwels-Dery *Eng* Dec 13-89; econ., notes from an

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STRAIGHT Line, 100 h. p. *El H/d* \* Aug 24-89

STRONG'S trip-expan. vertical *El Eng* \* Sep 28, *El Rev* \* Oct 15, 250 h. p. *E News* \* Sep 22, *Power* \* Oct -92

SULZER, Brussels exhib. *The Eng* Aug 17-88

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*Eng* Royal Agric. Soc. at Newcastle, Shaw, cor. \* Jan 6; steam consump. of compound and non-comp., Willans, Mar 16; Highland Soc. Show, Nov 16-88; Soc. of Arts, ed. Mar 29; Dulwich College experimental \* Nov 1; at Whitworth eng. lab. trials, Manchester, Reynolds, Dec 13-89; Sulzer type hor. trip-expan. 200 h. p., Schröter \* Dec 5-90; compound, expts., Reynolds *E & Min* \* Aug 9-90

*E News* several types, Carpenter, table, Aug 2-90; econ. of non-condensing, simple, compound and triple. Willans, and discuss., insets (very full) *Inst C E* \* v 93 -88, reply to cor. \* v 96, Westinghouse test, Alley, n v 96 -89; at Whitworth eng. lab., Manchester. Reynolds, and discuss., inset (full) \* v 99 -90

*Power* compound, Howland mill, New Bedford, Mass. (full) \* Dec -89; Utica, N. Y. Steam Cotton mills power plant, Carpenter \* Aug -92; econ. of non-condens., Willans *R Gaz* Aug 6 -88; expts. at Mass. Inst. Tech., Purinton, general review of tests, Peabody (full) *Soc Arts Mass* -88; Purinton *Tech Q* \* Feb -88

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THREE-cylinder, Paris exhib. *Eng* July 12-89

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*Pwr* Fishkill Corliss with Cite's releasing gear \* Aug -**88** \* Aug -**90**; link motion, Lyne \* Apr, June -**89**; Corliss valves setting \* Mar -**90** \* Nov -**92**; valves \* June -**90**; Child's piston valve *R & Eng* \* Jan -**89**; radial gears, J. R. Smith \* Feb \* Mar, Morton radial \* May -**90**; valves, Hawley *Sc Am Sup* \* Jan 31 \* Feb 14-**91**; Proell gear, 800 h.p. tandem comp. *The Eng* Sep 7, 7-**88**; the Cross gear \* Apr 4-**90**. See also ENGINES, slide valves.

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**English** notes *E & Min* Aug 24, 31, Sep 14, 21, Oct 12, Nov, 23-**89**. See also GREAT Britain

**English**, Thomas A. *Inst C E* v 97 -**89**

**Engraving** rail sections, 4 styles, etc., ed. *E News* \* Dec 27-**90**

**Entomology**, Riley (full) *Sc Am Sup* Jan 17-31-**91**

**Ericsson**, John *Eng* Mar 15-**89**, Church, bk. review, Feb 13 **91**, por., inventions, etc., and ed. *E News* \* Mar 16-**89**, *Locom* Apr -**89**, por. (full) *R & Eng* \* Apr -**89**, life of, Church, bk. review, Jan **91**, por. *Sci Am* Mar 16, Capt., and his work, 23-**89**, MacCord (full) *Sc Am Sup* Feb 8-**90**, *Stevens Indic*, ed. *The Eng* Mar 29-**89**

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**Ether**, elec. and ponderable matter, W. Thompson (full) *El Wld* \* Apr 27-**89**; first capital operation, Slade *Scribner's* Oct -**92**

**Ether** engine, Susini's *Sc Am Sup* \* Nov 14-**91**

**Ethics** and railroad supplies *R & Eng* Dec -**89**

**Etna**, volcanic eruption *Sc Am Sup* Aug 27-**92**

**Evaporation** of moisture from various substances, expts., Worrell, table *Sc Am Sup* July 7-**88**

**Events**, current, monthly record *Harper's* files

**Evolution** *Locom* Aug -**89**; mental, in man and lower animals, Bodington *Sc Am Sup* Aug 6-**92**

**Ewing**, J. A., por. *El Wld* \* Jan 17-**91**

**Excavating** and excavators. Panama Canal, Willans, insets *Am C E* \* v 19 -**88**; steam, Clements *Am M E* \* v 9 -**88**; methods and cost of working by steam excavs., Clements *E News* \* May 26, June 9-**88**; a great rock excav., Tilly Foster mine, Brewster's station, N. Y. \* Apr 20; excavator for sewer trenches \* Sep 27-**89**; and hoisting machinery, the White, Minn. \* June 6-**91**; trenching and pipe laying, Fitz Gerald *E Rec* \* June 15; timbering shafts, Croton aqueduct \* Aug 17, 31-**89**; at Panama canal, Nansouty, abs. *Inst C E* v 94 -**88** \* *Genie Cîvil* \* v 13 -**88**; Darby broadside steam digger *Sc Am Sup* \* Sep 1-**88**, *Iron*. See also DREDGING; MINING; SEWERAGE; TUNNELING

**Executions**, methods, n *Locom* Jan -**90**. See also ELEC. execution

**Exhibitions**, ethics of great, ed. *Eng* July 4-**90**. See also ELEC. exhibits.

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AM. Institute fair, N. Y. *Sci Am* Oct 20-**88**

CRYSTAL Palace Elec. *The Eng* \* July 22-**92**

EDINBURGH, 1890 *Eng* inset \* Apr 11-25, May 30, June 20 \* July 11, 25 \* Aug 15, 29 \* Sep 19, 26 \* Oct 10; *The Eng* Mar 28, buildings \* May 2-**90**

FRANKFORT Elec., plan *Eng* \* July 18-**90** \* May 8, 22, 29 \* June 5-July 24 \* Aug 7-28, Sep 4 \* Nov 13, *The Eng* \* Sep 18, 25 \* Oct 2-**91**

GLASGOW Internat. *Eng* Mar 23, plan \* Apr 20, May 4, 25, June 8-29, July 13 \* Aug 3, 10, Nov 9-**88**, *The Eng* Nov 18-**87**, Apr 27, May 11, June 1-**88**

Moscow, French Elec. at *Eng* \* Aug 21, 28 \* Sep 4, Oct 2-**91**

NAVAL, Royal, London *Eng* \* Feb 13, May 1 \* June 5, 12 \* July 17-31 \* Oct 2-16 \* Nov 27 \* Dec 11-25, *The Eng* \* Mar 13 \* May 1-29 \* June 5-26 \* July 10-31 \* Aug 14, 21-**91**

PARIS, notes *El Wld* Oct 5, 12-**89**, ed. *Eng* \* Apr 27, May 11, inset \* June 1, 29, ed. July 27 \* Aug 10, 31, ed. Sep 28 \* Nov 2-

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U. S., World's Columbian, Chicago, 1893, *Am C E* Gov't building dome ironwork. McGuire, insets (full) \* v 26-**92**; *Century* architecture. Van Brunt, May — Aug; Kirkland *Chaut* Dec -**92**

*El Eng* electricity at, Calkins \* Nov 23-**92**; *El Wld* Electric. bld. plan (large scale) \* Oct 24-**91**, electric. at \* Aug, Sep, Machin. bld. \* Oct 1, electric. at \* Dec 3-**92**

*Eng* Dec 27-**89**, ed. Mar 7, Berger on Chicago, Wood May 2, Berger July 4, Oct 3, Dredge Dec 5, ed. 5, 12 \* 19-**90**, Jan 2, ed. Feb 20 \* 27, ed. Mar 27 \* Apr 17 \* May 1, inset 25 \* June 5, inset 12, ed. 19, inset 26 \* July 10, ed. 17, 24, inset 31, 31, ed. Aug. 7 \* Sep 18, n \* Oct 9, 23, 30 \* Nov 6, inset 13 27, inset \* Dec 4, 4, Dredge, inset 11, 11, 18, 18, 25-**91**; \* Jan 1, Dredge, inset 8-29 \* Feb 5-19 \* Mar 4-25, inset \* Apr 8-29 \* May 6, Gov't. bld. 20, 27 \* June 10, 24 \* July 1-29 \* Aug 5, Dredge, 12, Wood report, 19, 26 \* Sep 2, cost of exhibiting, 9, 16, 23 \* Oct 28 \* Nov 11-25, Transport. bld. \* Dec 2, 9, Dredge, Electric. bld. \* 16-30, Dredge, 30-**92**

*E Mag* mechan. display, Atkinson, Apr; buildings, Freitag \* Nov -**91**, Manuf's bld., greatest of all fair buildings., do. \* July; and death rate of 1893, Bayles, Dec -**92**

*E News* original buildings, ed. Oct 5-**89**, novel plan, Jennison \* Mar 15, ed. 29-**90**, vs. N. Y. City, ed. Aug 10, proposed N. Y. site for, ed. Sep 29-**89**, general plan \* Mar 28 Sep \* 26, birds-eye view \* Oct 31, figures 31-**91** \* Jan 16, n 23, 30, buildings, inset \* Feb 13 \* Mar 5, dome 12, 26, Apr 9 \* 21, Mining

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*E Rec* blds. \* June 25 \* July 9, insets \* Aug 6, 13, 27 \* Sep 17 \* Oct 8-22, Machin. Hall details \* Nov 19, 26 \* Dec 24, 31-**92**; *F Inst* inset \* May -**92**; blds. foundations and floors, Gottlieb *J Assoc E Soc's* Dec -**91**; the designers of the fair (architects), pors., Millett *Harper's* \* Nov - **92**

*R Gaz* Oct 3, 11, n Dec 6-**89** \* Aug 7 \* Sep 25-**91**, buildings \* July 1, \* Aug 26 \* Sep 16, 23, \* Oct 14; World's Congresses of 1893, Bonney, por. *Rev of Revs* \* Oct -**92**; *Sc Am Sup* (full) Feb 15-**90**; Dredge (full) Jan 3, tower \* Apr 4, \* Aug 29-**91**; making of the white city, Bunnier *Scribner's* \* Oct; Chicago's part in. Mac Veagh, Nov; decoration of, Millett \* Dec -**92**

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**Explosives**, historical notes, Guttman *Eng* Nov 8-**89**; expts., So. Wales mining, Sep 12-**90**; firing point table. n *E Mag* Apr -**91**; value of hydrocarbon explosives for mining, Walker *E & Min* Aug 11-**88**; modern, Deering, Feb 23; high, notes, Dec 28-**89**; use of in fiery mines, Nov 29-**90**

*E News* high, list of. Mar 31; and their composition, Foster, list, June 30, July 7-**88**, classification of, do. Jan 12, high, properties and use of, July 6-**89**; relative strengths of high, Walker, Jan 31-**91**; high, in warfare, Barber *F Inst* Feb -**91**; employment in presence of fire-damp, report, abs. *Inst C E* v 99 -**90**, *An Mines* v 14 -**88**; and ordnance material, Emmens, abs. *Inst C E* v 108 -**92**, *U. S. Naval Inst* pro -**91**; Deering *R Gaz* Feb 15-**89**

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CAKE-powder, perforated, for ordnance, Quick, abs. *Inst C E* v 97-**89**

CARBO-dynamite *Eng* Apr 20, *Sc Am Sup* May 19-**88**

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GUN-cotton, hist., manuf., Rohrer *Sci Am* Feb 23-**89**

GUN-powder, blasting, form of crater produced by exploding in a homogeneous solid, Firmstone, insets *Am Min* \* 18-**90**; smokeless *E & Min* July 5-**90**, *Industries*, do. *E News* July 5-**90**, do. expts. at Essen, abs. *Inst C E* v 100-**90**; manuf., F. H. Robinson *Sc Am Sup* Dec 1-**88**; improvements in, Abel (full) Oct 18-**90**; smokeless, do. (full) Apr 12 \* June 28, do., Helene (full) \* Oct 4-**90**, do. Maxim (full) Sep 26-**91**

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**Ferro**-silicon and econ. of its use, Keep *Eng* Jan 11-89

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'SOLANO,' Cen. Pac. R., Harris, insets (full) *Am C E* v 22 -90

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**Field**, Cyrus W., por. *El Rev* \* July 23-**92**

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**Figures**, curiosities in *E News* Dec 29-**88**. See also ARITHMETIC

**Finance**, Inst. of Actuaries, Text-book of Prins. of Interest, Life Annuities and Assurances, King, bk., C. & E. Layton, Lond '87; English currency commissions arguments *E & Min* Nov 24-**88**

**Finland**, canals, roads and railroads of. See CANALS, Finland.

**Fire** alarms, Denio system *El Eng* \* Oct 5-**92**; the Rogers auxil. *El Wld* \* Oct 13-**88**; Gaynor system \* May 11-**89**; N. Y. service, n \* Nov 28-**91**

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**Fire** Commission, Howes, Fitzgerald, Fry report, description of depts., N. Y., Chic., Phila., Balt., Cincin., fire losses, table, etc. *Boston Herald* Mar 4-**90**

**Fire-engine**, Dewey's *El Rev* \* Mar 7-**91**. See also STEAM fire engines

**Fire** extinguishers, Lufkin's elec. method *El Eng* \* Sep 3-**90**; Carver's ap. July 7 \* Sep 7-**88** \* Feb 15-**89**; water required, ed. Dec 20-**90**, do. *E Rec* Jan 10-**91**; extinguishing, Woodbury, cor. *E News* Jan 11-**90**; Hexamer's, for malt mills, com. report, n *F Inst* Apr -**89**; Mackey aut. *Sci Am* Nov 3-**88**; Met. fire brigade, Lond. *The Eng* Feb 3; Douse's aut. fire-check, Nov 23-**88**

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- LIGHTING, centenary of *Eng* July 29-**92**; incandescent, MacKean *E & Min* May 16-**91**, *J Soc Chem Ind*; st., Kan. C., cost of *E News* June 28-**90**; history *E Rec* May 9-**91**; Paris exhib., hist. of artif. illum., report (full) *Sc Am Sup* Oct 22, 29-**92**; by incandescence, Shapleigh (full)\* *Soc Arts Mass*-**89**
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- Grates**. See FURNACES, grates
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**Griffin**, Heneage M., por. *E & Min* \* May 30–**91**

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*The Eng*, the Graydon shell \* Feb 22; ar. for ships, Barnaby \* Apr 12; compound ar. and steel, Schneider, July 12, 12; Dutch ar. trials \* Nov 22-**89**; artillery expts. at Buckau \* Sep 26 \* Oct 3; steel-faced ar., St. Petersburg trial \* Nov 21-**90**

*The Eng* Russian ar. trials \* Jan 9; deck ar., for vertical fire, expts., Japan \* June 5; Bethlehem steel ar., after test \* Aug 28; Royal ordnance factories, constitution of, Great Brit. Oct 9; ar. trials at Shoeburyness \* Nov 6, at Portsmouth, England \* Nov 13-**91**

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- ARMSTRONG rapid fire *R & Eng* \* July -**91**, *Industries*; 110<sup>1</sup>/<sub>2</sub>-ton. for str. Victoria *The Eng* \* Mar 28, str. Teutonic \* Dec 19-**90**
- BREECH-loading, mechanism for 10-in. *Eng* \* June 10-**92**; 12-in. army rifled *R & Eng* \* Sep -**91**, *Iron Age*
- BOFORS cast steel, Michaelis *Am Min* v 16-**88**, *Sc Am Sup* Sep 15-**88**
- BROWN segmental wire-wound *E News* \* Nov 24-**92**, *Sc Am Sup* \* Jan 11-**90**, Wittman \* Dec 24, *The Eng* \* Nov 11-**92**, *Am Min*
- CANET quick firing, with elec. training gear *El Rev* \* Sep 27-**90**; 66-ton. test *Eng* Feb 27, Sep 4; vs. Krupp, Dec 25-**91**, Jan 1, 15-29, Feb 5, Apr 1, May 20, June 3, 10-**92**; large, for Japan *E News* \* Jan 30; and ar. trials *Sc Am Sup* \* Jan 16, 16-**92**; *The Eng* \* June 12 \* Dec 11-**91**
- CANNON, mod. high power rifled, development, Califf (full) *R & Eng* \* Jan \* Feb. Apr — \* Oct -**89**
- COLT'S navy revolver, com. report *F Inst* \* May -**90**
- DRIGGS-Schroeder quick firing *Eng* \* Oct 28-**92**
- DYNAMITE, development, Batcheller *E Mag* \* Sep -**91**; 15-in., trial *Sci Am* Feb 16-**89**; Zalinski pneu. *Sc Am Sup* \* May 12; pneu., Haig \* Mar 10, do. *The Eng* Feb 3, Zalinski, 17-**88**; U. S. navy report, Mar 29-**89**; the Graydon \* Jan 30-**91**; pneu. sea-coast (full) \* June 10, 10-**92**
- ELSWICK *Eng* \* Oct 25 \* Nov 1, 15-29-**89**, Naval exhib. \* July 17, gallery, do. *The Eng* \* May 1-**91**; 6-in. disappearing carriage \* Mar 11-**92**
- FACTORIES, of Forges and Chantiers, Havre (full) *Sc Am Sup* \* June 21-**90**; Royal ordnance, constitution of, Great Britain. Anderson *The Eng* Oct 9-**91**
- FIELD, and mountain, Armstrong *Eng* \* Dec 6-**89**; Russian field and coast *Sc Am Sup* \* Sep 1-**88**, *The Eng*
- FRENCH artillery, insets (full) *Eng* \* Jan 3-**90** — Apr 24-**91**; quick firing, ed. Aug 12-**92**; mod. *Sc Am Sup* \* July 19-**90**
- GERMAN magazine rifle *Eng* \* May 15, new *Sc Am Sup* \* Jan 3-**91**
- GIFFORD liquid-gas *E News* \* Aug 9, carb. acid *Sc Am Sup* \* Aug 30-**90**
- GRUSON'S quick fire *R & Eng* \* Apr. *The Eng* \* Jan 10-**90**

- Guns**, HOTCHKISS ordnance *Sc Am Sup* \* July 13-**89**, revolving cannon \* Mar 7-**91**, *Eng*; Paris exhib. *The Eng* \* June 7-**89**
- HOWITZER, 11-in., Armstrong *Eng* \* Jan 6-**88**; cast iron, Spain \* Mar 11-**92**; high angle battery *The Eng* \* July 18-**90**
- KRAG-Jorgensen repeating rifle *E News* \* Oct 6, *R & Eng* \* Oct -**92**
- LEBEL magazine rifle *Sci Am* Oct 27, *The Eng* Sep 28, 28-**88**
- LONGRIDGE, the *Eng* \* May 4, 11, *The Eng* May 11-**88**
- MACHINE, Miller's aut. indicator for *Sci Am* Mar 9-**89**
- MAGAZINE rifles, rifle-mark, ed. *Eng* \* Feb 6; the Mannlicher (our new) \* Mar 6; the Mauser \* Apr 3; Swiss \* Oct 2; Rees' \* Nov 27-**91**; new *Sc Am Sup* Apr 5-**90**; mag. guns development, A. Russell \* *Soc Arts Mass* -**90**; *The Eng* \* Apr 4-**90**; new \* Feb 6; small arms, tests, N. Y. \* Sep 4-**91**
- MAXIM aut. machine, inset *Eng* \* Jan 27; 3-pounder \* June 22-**88**; \* Oct 9, 16-**91**; *Sci Am* Feb 16-**89**; *Sc Am Sup* \* July 7, *The Eng* June 1-**88**
- MORTARS, U. S. cast iron coast *Eng* \* Mar 18, 25 \* Apr 1-22, do. 12-in. breach-loading rifled *E News* \* Dec 8, *R & Eng* \* Dec -**92**; 12-in. manuf., Fuller, Connet *Sc Am Sup* \* Sep 6-**90** \* Jan 17-**91**, *Steven's Indic*; 12-in. rifled, S. Mansfield *Soc Arts Mass* -**91**; mod. breech-loading rifled construct., A. Russell *Tech Q* \* Apr -**92**; Whitworth mounting for high angle fire *The Eng* \* July 24-**91**; U. S. breech-loading \* Dec 9-**92**
- MOUNTINGS, strs. Devastation and Rupert *The Eng* \* Apr 24 -**91**
- NORDENFELT, disappearing turrets for *Eng* \* Oct 30-**91**; light quick fire batteries *The Eng* Jan 20, Feb 24 -**88**
- PNEU., torpedo, Zalinski *Eng* July 12-**89**, do. *R & Eng* \* May -**88**; *Sc Am Sup* \* Oct 12; the Dudley *The Eng* Sep 6-**89**
- QUICK firing, rapid firing, Kimball *Eng* Jan 13, Feb 10, 24, Aug Aug 24-**88**; ed. Sep 30, Oct 7-**92**. See also GUNS, Drigg's—Gruson—Nordenfelt—Schneider, etc.
- RIFLES of mod. armies *R & Eng* Jan -**88**; military rifle development, Califf \* Jan \* Feb -**89**, do., reduction of calibre in. Dunn *Sc Am Sup* Dec 22-**88**
- RUSSIAN artillery in 1888 *The Eng* July 27-**88**
- SANSAPAREIL, the *The Eng* \* Feb 6-**91**
- SCHNEIDER quick-firing *Eng* \* Sep 16-**92**
- SMALL arms manuf., Rigby *Eng* Dec 2, *Inst C E*, *The Eng* Dec 2-**92**; magazine, tests, N. Y. \* Sep 4-**91**

## 182 GUNS, STEADY – HARBOR ENGINEERING

**Guns**, STEADY platform, Tower's *Eng* \* Apr 26-**89**

TESTING at Sandy Hook, Perrine *E Mag* \* June -**92**

THURLOW cast-steel *E News* Feb 16-**89**

U. S. mod. artillery *Eng* \* Apr 29 – Sep 23, table (full) 30 \* Oct 7, 21, 28 \* Nov 4-**92**; new cannon for, n *E News* Jan 31; ordinance, notes, table *R & Eng* Aug -**91**, *Ar & Navy J.* See also GUNS, mortars. U. S.

**Gutta-percha** *El Rev Lond* Nov 21, Dec 5-26-**90**, Jan 2, expts.

Mar 6, supply, n Oct 23 -**91**, do., Serullas, May 20-**92**, future supply, do. *Sc Am Sup* Nov 5 -**92**

**Gymnastics**, exercises and ap. *Sc Am Sup* \* Mar 16-30 \* Apr 6 -**89**; \* June 7-**90**

**Gyroscopes**, Jansen, cor. *The Eng* \* Sep 30-**92**

**Hack**, Thomas *Inst C E* v 93 -**88**

**Hackney**, William *Inst C E* v 100 -**90**

**Haghe**, Augustus *Inst C E* v 101 -**90**

**Hall**, Richard T. *Inst C E* v 99 -**90**

**Hall**, William J. *Inst C E* v 102 -**90**

**Hallauer**, Octave-René, Hirn *The Eng* June 13-**90**

**Hamand**, Arthur S. *Inst C E* v 97 -**89**

**Hamill**, Edward D. *Inst C E* v 109 -**92**

**Hamilton**, George A., por. *El Wld* \* May 11-**89**

**Hammers**, Thwaite's suspen. pneu. power *Eng* \* Mar 13 -**91**;

aut., the MacCoy pneu. tool *E News* \* July 27-**89**; and rams, Jameson *R & Eng* Oct -**89**; the Longworth power \* Aug -**92**, *The Eng*; pneu. *Sc Am Sup* \* Apr 25-**91**; blows, force of, *The Eng* Aug 30-**89**. See also STEAM hammers

**Hampton Roads** *R & Eng* Oct -**90**

**Hancox**, Joseph *Inst C E* v 99 -**90**

**Hand-writing**, elec. transmitting, Gump \* *Soc Arts Mass* -**89**

**Hanna**, Francis B. *Inst C E* v 102 -**92**

**Hanscom**, William W. *Am M E* -**88**

**Harbor engineering** *Eng* harbors, natural and artificial, Cheesewright, Mar 20; concrete in har. works, Apr 17-**91** \* Aug 26 \* Oct 7-**92**

*E News* physical phenom. of entrances, Haupt \* Feb 25-**88**; excav. under water, cost, table, U. S. Eng'r. Dept., Jan 5; submarine excav. in sand, Ter-Meulen excavator \* Mar 23-**89**; double sextant for hydrographic surveys \* June 28; subaqueous foundations, Kinipple \* Dec 13, 27-**90**; shore protection \* Feb 6 -**92**

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*E Rec* subaqueous foundations, grouting below water, Kinipple, Feb 21; coffer dam or caisson without timber or iron, Harris, Mar 7; natural and artif., Cheesewright (full) \* Apr 18 **91**, do. *Sc Am Sup* \* May 30 \* June 6-**91**; use of beton in construct. of ports, Kinipple \* Nov 24 **88**; Am. eng., Wisner, Aug 15; Lobnitz system of rock removal under water without explosives \*Oct 3 **91**; submarine excavs. in sand \*May 18-**89**, *Genie Civil*. See also CANALS; DAMS; DOCKS; DREDGING; FIRE IS; FLOOD gates; FOUNDATIONS; LANDING stage; LIGHT-houses; MARINE signals, types; PIERS; PILES; RESERVOIRS; RIVERS imp., etc.

ANTWERP port works, Matthys abs. *Inst C E* v 101 -**90**

ARDROSSAN works *Eng* Nov 1-**89**

BARS, in tidal estuaries, Wheeler *Eng* Feb 7 **90**; imps., Haupt *F Inst* July, D'Auria, Sep, discuss., Haupt, Oct -**89**

BAYONNE port *Eng* \* Dec 6-**89**

BEACON lights and fog signals, Douglass *The Eng* \* Mar 29-**89**

BILBAO *E News* \* Aug 31-**89**

BORDEAUX port *Eng* \* Dec 13-**89**

BRAZOS river imp. and, Craighill, Corthell, discuss. *Am C E* v 26 -**92**

BREAKWATERS, concrete, Del. bay *E News* \* Jan 31; do., Schermerhorn report (full) *E Rec* \* May 16-**91**; and force of impact of waves, d'Auria *F Inst* Nov -**90**, Jan -**91**

BREMEN works, abs. *Inst C E* v 96 -**89**, *Zeit deut Ing* -**89**

BUOYS, elec. lighted, N. Y. *El Wld* \* Feb 2-**89**; and beacons, the Pintsch compressed gas system *E News* \* Jan 17-**91**; buoying and lighting tidal rivers, Wheeler *The Eng* \* Apr 8, 29-**92**

CALAIS works, France *Eng* \* May 17, inset, 24, 31-**89**; quay foundations, Betillart report *E News* \* Jan 4-**90**; Richou, abs. *Inst C E* v 101 -**90** \* *Genie Civil* v 15-**89**; inset *Inst M E* \* July -**89**

CAPE Hatteras, Walters *E Mag* \* July -**92**

CHARLESTON imp., Wisner *R Gaz* Sep 30-**90**

CHICAGO as a sea-port, maps *Eng* \* Feb 20, do. *Sc Am Sup* \* Mar 28-**91**; ed. *R Gaz* July 15-**92**

CORK port, deep-water quays, Barry, inset *Inst C E* \* v 100 -**90**

CORPUS Christi, Tex., deep-water project, Kent *E & Min* \* Aug 23-**90**

**Harbor**, DEFENCE, elec.. Sims-Edison torpedo *EI W'd* \* Apr 25 -**91**

DELAWARE breakwater imp. *E News* \* Feb 6-**92**

DIEPPE, Alexandre, abs. *Inst C E* v 93 -**88** \* *An Pouts* v 14 -**87**

DOCKS, N. Y. bulk-head construct. *E News* \* May 25-**89**; Royal Albert, blowing up of basin wall at, Thomas \* Sep 20-**90**. See also DOCKS; HAR., Hull — Limerick, etc.

DUBLIN port. Griffith, insets *Inst M E* \* July -**88**

DYKES, brush, spec. for, Craighill *E News*, Oct 19-**89**. See also DIKES; HOLLAND, do; RESERVOIRS; RIVERS, imp.

ENGLISH, new schemes *Eng* Jan 23-**91**; Brit., and water-ways *The Eng* Aug 5-**92**. See also HAR., Goole

GALVESTON, Tex., entrance imp.. Wisner, cor. *E News* Dec 6-**90**; prob., Haupt *F Inst* Oct -**91**

GOOLE port imp., E. coast, England *The Eng* \* Dec 20-**89**

GREAT Yarmouth, Ayers, cor. *Eng* \* Dec 13-**89**

HAMBURG, Alster lock widening, Roeper *Inst C E* v 107 -**92** \* *Deut Bauz* -**91**

HAVRE port *Eng* Oct 25, Nov 8 \* 29 -**89**; imp. of sea-ports of Seine, LeBrun, abs. *Inst C E* v 93 -**88**, Rochemont *Mem Soc Ing Civils* \* Mar -**88**; imp. n \* *Sc Am Sup* Apr 13-**89**

HELL-gate, N. Y. See HAR., N. Y.

HULL, Alexandra docks, Hurtzig *The Eng* Mar 2-**88**

INDIA, West of, Portuguese R.. Sawyer, insets *Inst C E* \* v 97 -**89**

ITALY ports of, Gatto, abs. *Inst C E* v 104 -**91**, *Il Polit* -**90**. See also HAR., La Rochelle — Naples

JETTIES as applied to har. entrances, U. S., Haupt *Inst C E* v 99 -**90**. See also RIVERS, jetties

LAKE Ontario natural harbors *E News* \* Mar 8-**90**

LA ROCHELLE works, Italy, com. report, abs. *Inst C E* v 95-**89**, *Giorn Genio Civil* June -**88**

LIMERICK dock walls, failure and construct., Hall *E Rec* \* Mar 28-**91**, *Inst C E*

LYNN Haven Bay as a har. of refuge Barroll *R & Eng* \* Dec -**91**

MALINO, Sweden *E News* \* May 26-**92**

MARIANOPOL works, Hermann, abs. *Inst C E* v 103 -**91** *An Pouts* Aug -**90**

MEMPHIS imps *E News* \* Nov 2-**89**

**Harbor**, MONTREAL imp. *E News* \* May 2-**91** ; old revetment wall, Sproule *R & Eng* \* Dec, *R Gaz* \* Nov 18-**92**

NANTES port of *Eng* \* July 19, 26-**89**

NAPLES works, Gatto, abs. *Inst C E* v 102 -**90**, *L'Ingeg Civile* -**90**

NEW York, bulk-head construct. *E News* \* May 25-**89** ; imp. of entrance, Edwards, dredging ap., inset \* Mar 19 ; masonry sea-wall, light-house station \* Dec 15-**92** ; removal of obstructions, Hell-gate, abs. *Inst C E* v 93 -**88**, \* Report Ch. of Eng'rs. U. S. Army -**86** ; imp. *Sc Am Sup* \* Aug 25-**88**

OTAGO imp. Barr *Inst C E* v 110 -**92**

PIERS. See PIERS ; WHARFS

PHILADELPHIA port of, Haupt *F Inst* Jan, Mahan, Mar, Apr -**92**

POINT Judith harbor of refuge, R. I. *E News* \* Apr 18-**91**

POOLE improvement *The Eng* May 8-**91**

PORTSMOUTH, tides near, Townshend, inset, abs. *Inst C E* \* v 97 -**89** ; dockyard, C. Robinson *Sc Am Sup* \* Dec 3-**92**

PRESTON docks *The Eng* Mar 23-**88**

RICHMOND, Va., eng. prob. at, Adams *Am M E* \* v 12-**91**

ROCHELLE, compressed air pier foundations, Thurninger, La Pallice har., abs. *Inst C E* v 100 -**90**, *An Ponts* \* Nov -**89**

ROUEN port of *Eng* \* Oct 11-**89**

SABINE Pass imp., Turtle, cor. *F Inst* Sep -**88**

ST. John, N. B., imp. and docks *E News* Apr 7-**88**

ST. Nazaire, France, lowering masonry shafts for quays, Mahan *E News* \* Oct 27-**88**

SALTBURN-by-Sea, works near *Eng* \* Mar 14-**90**

SAN Francisco, water-front structures, Manson *E News* \* Dec 29-**88** ; caisson used in founding sea-wall, R. Hunt \* Aug 2-**90**

SCOTLAND. N. and West coast piers and, Barron, inset *Inst C E* \* v 99 -**90**

SEA-walls, use of asphaltum in, Ambrose, and discuss. *Am C E* v 24 -**91**, do. *E Rec* May 16-**91** ; caisson used in founding, San Francisco, R. Hunt *E News* \* Aug 2-**90** ; masonry, light-house station, N. Y. \* Dec 15-**92** ; sinking foundation of by water-jet *E Rec* \* Mar 14-**91** ; Scarborough, No. Cliff, and Royal Albert drive securing, Aytoun, insets *Inst C E* \* v 105 -**91**

SWANSEA port and dredging entrance channel, Capper *Inst C E* v 103 -**91**

- Harbor**, TEXAS deep-water port, need of the So. West, Haupt *R Gaz* Aug 10, *Sc Am Sup* Oct 6-**88**
- TORONTO esplanade question *E News* \* Jan 4, 11-**90**
- U. S. river and har. appropriations *E News* Mar 8-**90**; Southern states tide-water terminals, Haupt *R Gaz* Mar 15, Apr 12-**89**
- VERA Cruz port, *E Rev* Dec 6-**90**, Corthell cor. Feb 21-**91**
- WILHELMSHAVEN, second entrance construct., Rechtern, abs. *Inst C E* v 107-**92** \* *Zeit Arch Ing* Hanover-**91**
- WIVENHOE, dry dock at *The Eng* Aug 17-**88**
- YOKOHAMA *Eng* \* Dec 12-**90**, cor. May 22-**91**
- Harcastle**, Bey. William J. *Inst C E* v 107-**92**
- Harker**, Harold H. *Inst C E* v 109-**92**
- Harp**, the clavi-harp *The Eng* Apr 27-**88**
- Harper**, Edmund L. *Inst C E* v 105-**91**
- Harpur**, Samuel *Inst C E* v 95-**89**
- Harris**, Robert *Inst C E* v 110-**92**
- Harrison**, John T. *Inst C E* v 109-**92**
- Harrison**, Thomas E. *Eng* Mar 23, por. \* Apr 13, *The Eng* Mar 23, por. (full) *Inst C E* \* v 94-**88**
- Hat-making processes** *Sc Am Sup* \* Sup 626, Jan 14, 21-**88** (628) *Industries*
- Hawaii**, business opportunities, Hau *E Mag* \* June-**91**
- Hawkes**, Edward C. *Inst C E* v 101-**90**
- Hawkins**, Edward J. *Inst C E* v 109-**92**
- Hawkins**, George *Inst C E* v 95-**89**
- Hawkshaw**, John *Eng* June 5, *The Eng* June 5, por. (full) *Inst C E* \* v 106-**91**
- Hay fever**, Stockwell (full) *Sc Am Sup* Aug 31-**89**
- Hay-press**, and straw, Roy. Agric. Soc. trials *The Eng* July 6-20-**88**
- Hayti**, Ravine du Sud, averting overflow. Crowell, insets *Am C E* \* v 24-**91**
- Hayward**, William *Inst C E* v 103-**91**
- Heal**, Chesley, the centenarian *Locom* Mar, *Sci Am*, por. (108 years old) *Sc Am Sup* \* Mar 16-**89**
- Health**, congress, Lond., pro. *Eng* Aug 14-28-**91**; and physical exercise, Taylor *F Inst* Sep, Oct-**92**; prevention of consumption, Prudden *Locom* Aug-**89**; disinfection *The Eng* May 11, 18, the Lyon's, June 1-**88**
- Hearst**, George, por. *E & Min* \* Mar 7-**91**

**Heat**, thermal quantities, graphic representation of, De V. Wood *Am M E* \* v 11 -90; transmission through cast iron plates pickled in nitric acid, Carpenter, do. Royse \* v 12, 12 -91; temp. taking by tuning forks *El Rev* Aug 15 -91; proposed nomenclature in practical thermics, Wurtz *E & Min* Dec 14, 21 -89

*E News* production from electricity, ed. Aug 9; mechan. equiv. of, Rowland's expts. for det., n Aug 16 -90, do. De V. Wood *Steven's Indic* July 15, do. *Locom* Feb, do. *R & Eng* Feb -88, expts., Perot (full) *F Inst* Jan, Isherwood \* Feb, Joule's equiv., Thurston, Apr -92, hist. of *Locom* Apr -89, do., Hanssen *Sc Am Sup* Apr 21, Wood, May 26 -88, *J Gas L'ng*

*F Inst* temp., definition, theoret. and expt., Pictet and Isherwood, Sep -88; latent, of vaporization of volatile substances, Chappuis, Feb -90; and its mechan. applics. (lectures), bk. \* *Inst C E* -85; measurement of high temps., Roberts-Austen, discuss. (full) \* v 110 -92; absolute zero *Locom* Aug -92; radiant, instrums. for measuring, Boys (full) *Sc Am Sup* \* Nov 23, 30 \* Dec 7, 14 -89; dilatation of metals from low temps., Andrews \* Mar 15; measuring, Davis, Sep 13 -90; transforming into mechan. energy, Melmer, Dec 5 -91

**MOTORS**, Hargreave's thermo-motor *Sc Am Sup* \* Feb 18 -88, *Industries*; triple thermic, Haswell *Sc Am Sup* Apr 14 -88, *Am C E*

**REGULATING**, Hawkin's aut. ap. *Am M E* \* v 9 -88; Johnson's system, Chester *Soc Arts Mass* -88

**Heaters**, unbraced wrt. iron, heads *Locom* \* Feb -90. See also **BOILERS**, feed-water heaters

**Heating**, ap., Hawkins aut. regulator *Am M E* \* v 9 -88; house heating, L. Allen *E Mag* July - Sep -92; processes prog. and heavy chemical manuf. '90, Lunge (full) *E & Min* Apr 25 -91; green-house, Conrad *E Rec* Mar 29; proportioning radiating surface, Carpenter, Nov 29 -90; system on receiving tanks *Locom* \* Jan -90; action from open grates, stoves and hot pipes, Dye (full) *Sc Am Sup* \* Mar 12; gas production and ammonia, Hennin, Oct 15 -92. See also **CARS**, heating

**BOSTON** Heating Co. plant, Abbott, insets *Am Min* \* v 16 -88, notes *E News* Jan 14, Dec 8 -88, plant *E Rec* \* Apr 28 \* May 5-26 -88

**MASS.** Inst. of Tech. system, Boston *E News* \* Feb 25 \* Mar 3 \* May 19 -88

**Heating**, Hot water, and a steam plant, comparative test, Carpenter *Am M E* \* v 11 -90; town heating by, Abbott *Eng* \* Aug 30 \* Sep 6-89; vs. steam *E Mag* \* Sep -91; and steam plant, comparative test, diags. *E News* \* May 24: of John Hopkins hos., bk. n. Nov 22-90; Westchester Cty. almshouse *E Rec* \* Dec 3; and fitting, 31-87 \* Jan 7, June 23, 30, July 7, Aug 18, 25, Sep 15, 22, Oct 13-27, Nov 3 \* Dec 15-88 \* Jan 5, 12, 26 \* Feb 2-23 \* Mar 2-16 \* June 29, Mackay, Nov 30, Dec 7-89; simple arrangement \* Oct 17-91; Nat. Bank building, Waltham, Mass., Sanborn \* Apr 23-92; explosion of a hot water boiler *Locom* Apr -88; Baldwin, bk. review *R Gaz* May 17 -89

STEAM, Kortings low-pressure boiler *E Rec* \* Nov 9-89; Plaza hotel, N. Y. \* Dec -90 \* Jan; Trinity Church, N. Y. \* 17-91; house boiler test, Baldwin, Apr 16-92. See also STEAM heating

**Heating** and ventilation, Sturtevant, pph., Boston, 1888; of an office and warehouse building, econom. method Snell *Am M E* \* v 9 -88, do. *Eng* \* Jan 6, do. *E News* \* Jan 7-88; air vitiat-ing properties of artif. lights, Lidy, table *El Rev* Sep 10-92; ventil., ed. *Eng* Dec 23-92; of homes and schools, L. Allen *E Mag* Apr, Aug, Sep; ventil. factory buildings, Snow \* July -91

*E Rec* of buildings, Baldwin, Aug 31 \* Sep 7, 14-89; school-houses, Aug 2-30, Sep 6, 13; Mass. Inst. of Tech. bld. \* Nov 29-90; John Hancock bld., Boston \* Feb 7; sanitation in schools \* Apr 25 \* May 2; Englewood, Ill., church \* May 9; Pueblo opera house \* 23, 30; N. Y. Music Hall \* July 4; use of gas for, Fletcher, 11; John Hopkins hos., Balt. \* 18 \* Aug 1-15, 29 \* Sep 5-26; U. S. Senate Chamber, Wash. \* Oct. 3; Chicago schools \* Dec 5-91 \* Jan 2-92

*E Rec* and plumbing, Duluth Union depot \* Feb 6; N. Y. Music Hall \* 6 \* Mar 26; ventil. of the Sorbonne Amphitheatre \* Feb 20; Syms operating theatre and effc. test \* July 2; N. Y. residence \* Nov 19, 26; Billings, Nov 19, Dec 10-92; of public blds., Elkinton *F Inst* Aug, do. *Locom* Sep; Jan -89; Eng. bld., Mass. Inst. Tech., Woodbridge \* *Soc Arts Mass* -90, notes, do. *Tech Q* \* May, new bld. do., insets, Oct \* Dec -88

**Heilner**, Marcus, por. *E & Min* \* Feb 14-91

**Heliochromy**. See PHOTOGRAPHY, heliochromy

- Helme**, William *F Inst* Aug -88
- Helmholtz**, Hermann Von, por. *El Wld* \* Sep 3-92, por. (full) *Sc Am Sup* \* Oct 10-91
- Hemberow**, Robert C. *Inst C E* v 92 -88
- Henry**, Joseph, por. *El Eng* \* Mar 9-92
- Heredity**, Turner (full) *Sc Am Sup* Nov 2, 9-89, *Nature*
- Hering**, Carl, por. *El Eng* \* Sep 24-90, por. *El Wld* \* Mar 7-91
- Herz**, Cornelius, por. *El Rev* \* Dec 31-92
- Hetherington**, Thomas R. *Inst C E* v 101 -90
- Hewitt**, Abram S., presentation of the Bessemer medal, Kitson addr. *Am Min* v 19 -91
- Highway** eng., instruction in, C. Allen (full) *Soc Arts Mass* -91.  
See also MUNIC. eng; PAVING; ROADS; STREETS
- Hilgard**, Julius E. *Am C E* v 27 -92, por. *E News* \* May 16-91
- Hills**, Graham H. (full) *Inst C E* v 95 -89
- Hindmarsh**, Thomas *Inst C E* v 97 -89
- Hingeston**, Charles H. *Inst C E* v 104 -91
- Hirn**, G. A., Dwelshauvers-Dery *Eng* Jan 31, por. \* Feb 14, *The Eng* Mar 21-90
- Hobson**, Anthony G. *Inst C E* v 91 -88
- Hochhausen**, William, por. *El Wld* \* Oct 12-89
- Hodges**, Almon D. Jr., por. *E & Min* \* July 18-91
- Hodson**, Richard *Inst C E* v 106 -91
- Hofmann**, Ottokar, por. *E & Min* \* Aug 8-91
- Hoisting**, hydr. pier plant, Brooklyn sugar refining Co.,<sup>1</sup>Engel *Am M E* \* v 12 -91; pneu., Wheeler *Am Min* \* v 19 -91; elec. machinery, Bolton *El Rev Lond* May 6-92; pneu. vs. cable (mine). Wheeler *E & Min* \* Oct 18-90; Carlin's friction drum power *E News* \* Oct 25-90; Lidgerwood six spool engine \* Feb 6; Otis machinery, Eiffel tower, Paris \* Sep 8-92; Roth's machine *E Rec* \* Dec 27-90; Teal's portable hoist, com. report *F Inst* \* Oct -89; Hart's clutch-hoist, com. report \* Nov -90; the Ulrich engine *Power* \* July -90; Cal. & Hecla mining Co. plant *R Gaz* \* Mar 21-90. See also ELEVATORS; RAILROADS, incline — mt; WINDING engines
- Holland** and its people, Edmonde de Amicis, Putnam's. N. Y., Lond. \* bk., 1890; dikes, notes on, Starling, insets and map. discuss. (very full) *Am C E* \* v 26 -92, *R Gaz* Nov 11-92; notes, Locke *E Rec* Dec 27-90

- Holley**, Alexander L., addr. at unveiling of por., Bayles *Am M E* v 12 -91, memorial addr., Dredge *Am Min* \* v 20 -92, memorial statue. do. *Eng* Oct 10-24, addr., Dredge *E News* Oct 4, por. \* 11, memorial *E Rev* Oct 11-90
- Homeopathy**, Helmut (full) *Sc Am Sup* May 17-90
- Homersham**, Samuel C. *Inst C E* v 109 -92
- Hopkinson**, John, por. *El Wld* \* Apr 11-91
- Horse**, origin, Huidekoper *Sc Am Sup* Jan 5-89; horse-shoe, hist. development, Zippelius (full) \* Sep 12-91
- Horse power**, nominal *E News* June 30-88; steam, what does it cost, Pray *F Inst* June, July; constants table *Pwr* Sep, of boilers, com. report, Sep -90; brake, cor. *The Eng* July 8, 15 \* Aug 12, 26-92
- Hose**, metal flexible, for air brakes *R Gaz* \* Feb 6-91; expts. See FIRE streams
- Hot air**, and steam for power *Cassier's* Nov -91; friction in pipes, cor *Eng* \* Jan 6-88; heating by, Chesebrough system *E News* Mar 10-88. See also HEATING
- Hot air engines**, McGahie *Cassier's* \* Mar -92; Woodbury-Merrill's and tests *E News* \* Sep 14-89; Benier's, abs. *Inst C E* v 92 -88, *Dingler* 267 -88, *Sc Am Sup* \* Apr 27 \* Dec 7, Paris exhib. *Eng* \* Aug 30-89, *The Eng* \* Sep 5-90; the Rider, Aug 10-88; Robinson's \* Nov 28-90; Hargreave's *Pwr* \* Mar -88; Woodbury's \* Oct -89. See also THERMO-motor
- Hot water heating**. See HEATING, hot water
- Hotel** Mont Dore, Bournemouth *Eng* Mar 1-89
- House**, Royal E., por., Hovey *Sci Am* Dec 22-88
- House**, refuse disposal *Eng* May 15; drainage from the architect's point of view, Corser *E News* \* Sep 19-91; do., Pierson *E Rev* Mar 8-90; do., ap. for cleansing and inspection *The Eng* \* Feb 22-89. See also DRAINAGE; MUNIC. eng; REFUSE disposal; SEWERAGE
- Houses**, hist. of human habitations *Eng* \* May 3; workmen's, Paris exhib. \* Nov 1; the Ducker portable, n *E & Min* \* Feb 2-89; hist. of dwellings, Garnier, Paris exhib. '89 *Sc Am Sup* \* Oct 6-88. See also POMPEIAN house
- Houston**, Edwin J., por. *El Wld* \* Sep 13-90
- Howe truss prob.**, solution with a carpenter's square, Howe *R & Eng* \* Oct 91. See also BRIDGES, HOWE truss
- Hughes**, D. E., por. *Sc Am Sup* \* Feb 8-90, *El Eng*
- Humphreys**, Henry T. *Inst C E* v 108 -92

**Hunt, Henry A.** *Inst C E* v 99 -90

**Hunt, Robert W.**, por. *E & Min* \* June 13-91

**Hunt, Thomas S.**, por. *E & Min* \* Nov 7-91, Feb 20-92

**Hunter, William H.** *Inst C E* v 100 -92

**Huntington, C. P.**, por. *Cassier's* \* July -92

**Hurst, Thomas G.** *Inst C E* v 103 -91

**Hutton, Frederick R.**, por. *Cassier's* \* Dec. por. *E & Min* \* Nov 21-91

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- CALIFORNIA, San Diego flume *E News* June 29-**89**; mining ditches in and loss by evap. Mar 8-**90**; system in San Bernardino Cty., Finkle, July 4 \* 25, Aug 8-29; Alessandro district, Oct 17-**91** \* Feb 6; Cucamonga Fruit Land Co. (full) \* Sep 29-**92**; Southern and artes. wells, San Bernardino Cty., Fox *Inst C E* \* v 105 -**91**; Hall *Sc Am Sup* Jan 4-**90**
- COLORADO, laws in *E News* Dec 29-**88**; Henry *Sc Am Sup* Apr 6-**89**
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- FLUME, San Diego *E News* June 29-**89**; the Laybourn iron \* Oct 17-**91**
- IDAHO *E News* Jan 4; Foote report \* Apr 26-**90**
- INDIA, in, H. Wilson, discuss., insets (full) *Am C E* \* v 23 -**90**, do. *E News* Nov 21-**91**; canals, report, Nov 10-**92**; in Mysore *E & Min* \* May 10-**90**; works, Mullins *E Rec* \* Dec 5-**91** \* Dec 2-**92**; works, 1887-88, stat. review, pph., abs. *Inst C E* v 99 -**90**; Culcheth, abs. v 108 -**92**; Barois *R & Eng* Nov, Dec -**92**, etc. *An Ponts*; as profitable eng. works *The Eng* Sep 6-**89**
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**Jacobi** (electrotyping inv.), por. *Sc Am Sup* \* June 8-**89**

**James**, William *Inst C E* v 99 -**90**

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**Jenks**, Charles W. *El Eng* Apr 30 -**90**

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**Jetties**, at Eston *Eng* \* Jan 20; for improving estuaries, Haupt *F Inst* Apr -**88**; ocean, in N. So. Wales. Harper, n *Inst C E* v 102-**90**. See also HARBOR eng., jetties; N. Jersey coast movements and jetty reaction; RIVERS, Miss. jetties, etc.

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**Jigging**, English vs. Continental system. Munroe (full) *Am Min* v 17 -**89**

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**Keefer**, Thomas C., por. *E News* \* Jan 21-**88**

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**Kennedy**, Rankin, por. *El Eng* Oct 14-**91**

**Kiddle**, William W. *Inst C E* v 98 -**89**

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**Kirk**, Alexander C. *Eng* Oct 7, 14, *The Eng* Oct 7-**92**

**Kleberg**, Charles G. *Inst C E* v 94 -**88**

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**Knitting**, without weft, Paget *Eng* \* July 19, 26-**89**, high speed. do. \* Feb 14-**90**; framework, Rowlett *Sc Am Sup* \* May 5 -**88**

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- Lamps**, safety, in collieries, Preece *Eng* June 15-88; heat generated by gas and oil, table *R Gaz* Dec 2-92; Harcourt's Pentane standard, Clifford *Tech Q* May -90. See also ELEC. lamps — lighting; HEATING and ventil; LIGHTING
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- Landscape** gardening, possibilities, Wolf *E Mag* Oct; beauty at Newport, DeWolf \* Dec -91; eng., Tuxedo Park, Haring \* Jan -92
- Landslides**, the Quebec *E News* \* Nov 2-89; Or. & Cal. R., Curtis *R Gaz* \* Aug 28-91; land-slip at Zug, Switz., abs. *Inst C E* v 95; in polder, Is. of Noord Beveland, Lambrechtsen, abs. v 96 -89, *Tijd Konink Ings* -88-89
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- Lanyon**, Charles *Inst C E* v 98 -89
- Lard** testing for cotton seed oil, Pattinson *Sc Am Sup* June 15-89
- Larsen**, Jorgen D. *Inst C E* v 104 -91
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**Leather**, Samuel P. *Inst C E* v 98-89

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**Le Mesurier**, Henry P. (full) *Inst C E* v 98-89

**Length**, standards of, Bond *Soc Arts Mass* -88. See also WEIGHTS and measures

**Leslie**, Frederick *Inst C E* v 98-89

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**Leveson-Gower**, Granville G. *Inst C E* v 104 -91

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**Life-buoy**, the Franklin *Eng* \* Nov 20 -91

**Life insurance**, life-expectancy rule *Locom* July -86; the expense margin in, Wills *Sc Am Sup* Jan 31 -91

**Life-saving**, and salvage str. Aid, inset *Eng* Mar 4; U. S. Service, Piper *F Inst* Jan; devices, Woolven *Sc Am Sup* \* Apr 2, 16-30 \* May 14 \* July 2, 9, 23 \* Aug 20, 27 \* Sep 10 \* Oct 1, appliances \* Dec 10 -92. See also LIFE boats—buoys; U. S. Life Saving Service

**Lifts**. See ELEVATORS; HYDRAULIC lifts

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*El Wld* photometry, personal error in, Nichols \* June 1 -89; new photom., do. \* May 31; the Bolometric spectrometer \* June 21; artif., of future, Nichols (full) \* Nov 29, discuss. Dec 6 -90; photometers \* Apr 25 -91; Hering's portable photom. for st. lights and illum. \* Jan 16 -92

*Eng* refraction goniometer, Trotter \* May 17 -89; illum., distrib. and measurement of, do. *E News* \* Nov 24, do. and discuss. (full) *Inst C E* \* v 110 -92; the ether-oxygen lime light,

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BULL Rock, So. Coast Ire. *Sc Am Sup* \* Oct 5 *The Eng* Aug 23 -89

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EDDYSTONE model, Naval exhib., Lond *The Eng* \* Apr 10 -91

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MEW Is., Dublin, Griffith, insets *Inst M E* \* July -88

OLD Orchard Shoal, N. Y. harbor *E News* \* Feb 6, *R & Eng* \* Mar -92

OYSTER Is., Burmah *The Eng* Sep 13-27-89

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**Lighting**, artif. illum., effic. of methods, Nichols (full) *El Rev Lond* \* Apr 12, 19, do. (full) *El Wld* \* Mar 30, do. abs *Inst C E* v 97 -89, do. (full) *El Eng* \* Apr -89; artif. of future, do. (full) \* Nov 26-90; elec., relation to optical science, Boyle (full) *El Wld* \* Nov 14-91; compressed oil-gas, Ayres *Eng* Apr 13-88; the Wells system *E News* \* Aug 10-89; illum. and ventil., Lewis *E Rev* Jan 11-90; Welsbach system, Granger *F Inst* \* May -88; developments in artif. illum., Morton *Sc Am Sup* Mar 16-89; by compressed oil-gas \* July 26-90; Harcourt's Pentane standard lamp, Clifford *Tech Q* May -90. See also ELEC. lighting; GAS-lighting; LIGHT

**Lights**, st. and illum., Hering's portable photom. for *El Wld* \* Jan 16-92; contractor's portable *E News* \* Nov 16-89; the ether-oxygen lime light, Ives *F Inst* \* Jan; the Lucigen, econom. illum. from waste oils, Hannay *Sc Am Sup* \* Jan 14; floating, 8-ft. cyl. lanterns *The Eng* Nov 9-88. See also ELEC. lighting and lights

**Light-ship** No. 5, with elec. lights, U. S. *R & Eng* \* Aug, abs. *Inst C E* v 106 -91

**Lightning** *El Eng* Varley Sep-Dec -88; arresters and photog. study of self-induction, Acheson (full) \* Feb; conductors and arresters, Brit. Assoc. discuss. Apr, May -89; arrester, Westinghouse \* Apr 9; the Wirt arrester \* May 7; conductors, Lodge, July 2-90; protection, Hodges \* Feb 11, Hubbell, June 17-91; arresters and discuss. of non-arcing metals, Wurtz (full) \* Mar 23-92

*El Rev Lond* Varley, July 20 - Oct 12, Nov 2, rotary motion, Parker, Dec 14-88; arresters and self-induction, Acheson \* Feb 1, 15; Lodge (full) May 3-24 \* June 6-20; conductors, Varley, July 5 \* 19, Aug 9, Oct 4, 18-89; connection, Fischer, Jan 24, 31, Feb 7; Mar 14-28; Apr 4, 11; conductors, Varley, May 24, 31, June 7-21; thunderstorms, Hazen, Aug 15; protection of buildings, Bennett, Oct 10-90; damage, curious case. Hands, Jan 8, protection, do. Feb 19-92

*El Rev* peculiar motions of, Parker \* Nov 24-88; arresters and self-induc., Acheson (full) \* Jan 19-89; arresters and discov. of non-arcing metals, Wurtz \* Mar 26; rods, McAdie, Sep 17-92

*El Wld* protection of elec. light stations, Jenks (full) \* Aug 18; rotary motions in, Parker, Nov 24-88; arresters and self-induc., Acheson (full) \* Jan 19, Brown, Child \* Feb 23-89; Lodge's protectors (wires) \* May 17; and the elec. spark, Bid-

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*Eng* protection from, ed. Aug 3 \* Sep 7; conductors, Brit. Assoc. pro. Oct 19, 26; flashes \* Dec 21-**88**; rods, E. Thomson *E Rev* July 11-**91**; Jove's autograph, Jennings, insets *F Inst* \* Jan -**92**; conductors, Kohlrausch, abs. *Inst C E* v 93 -**88**; do., connecting with water and gas pipes, Weber, abs. v 95 -**89**; conductors, Frisch report *Sc Am Sup* Jan 26; discharge, influence of gas and water pipes, Wilde, Aug 3-**89**; protection of chimney shafts, Molyneux, Wood, Apr 19-**90**; rod protection, Hodges, Apr 18-**91**; peculiar rotary motion of and elec. curs., Parker \* *Soc Arts Mass* -**89**

**Linberg**, Charles T., por. *E & Min* \* Apr 25-**91**

**Limestone** industry, Day *Sc Am Sup* July 25-**91**

**Lime** sulphite fibre manuf. in U. S., Michaelis and discuss., chem. of the processes, Griffin *Am C E* \* v 20 -**89**, do. (full) *Sc Am Sup* Jan 11-25-**90**

**Lindley**, Robert C. *Inst C E* v 92 -**88**

**Linnaeus**, por. *Sc Am Sup* \* Feb 18-**88**

**Liquids**, self-acting, measuring ap., Monte-jus *Eng* \* Dec 12-**90**; compressed, dilatation of, Amagat *F Inst* Sep -**89**; heating and concentrating by steam, Hudson *The Eng* Apr 11, 18 \* May 23 \* June 6, 13-**90**

**Liquors**, aging, Turner's ap., Ramsay's proc., Stauffer *Sc Am Sup* \* Sep 10; and preserves manuf., Brevans \* Nov 19, 26 \* Dec 3-31-**92**, etc.

**Liverpool**, works at *Inst M E* July -**91**. See also under DOCKS — WATER-works, etc.

**Locomotives**, Catechism of the Locomotive, Forney, bk. (very full) *R & Eng* \* Jan -**88** - Oct -**89**; effic. of, Dixon *Am M E* \* v 11 -**90**; econ. of the, Bell *El Wld* May 24-**90**; practice, ed, *Eng* June 29-**88**; express pass., Paris exhib., inset \* July 5, do. ed. 26, Aug 2, 9; Brit., cost of working, table, Nov 8-**89**; tank express double bogie, Brunner, cor. \* Sep 26-**90**

*E News* oscillations registering ap. Feb 8; frt., for So. Am. (meter gauge) \* May 17; effic. of, Dixon, Aug 16-**90**; of world, n Oct 20-**92**; vibratory movements of and on timing trains and testing R. tracks, Milne, discuss., insets *Inst C E* \* v 103 -**91**; speed and power, Hill \* v 109-**92**; shipping at high

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ABT, Manitou & Pike's Peak R. *R Gaz* \* Feb 6-91

AIR-pump governor, Barnes', Wabash R. *The Eng* Oct 19-88

AMERICAN, in New So. Wales *E News* July 21, Aug 18 \* Sep 22; and English, wts. comparison, Purdon, Oct 20; exhib., Dec 22-92, *Industries*; and English, speeds *Locom* July -89; and English, eds. *R & Eng* July - Dec -90, eds., May, Aug, Nov, Dec -91, Jan, tables (full) Feb., (full) June, Aug -92

*R Gaz* in New So. Wales, cor. June 1-88; and English, ed. Apr 25, (full) May 9-90, Dean, July 10, relative merits, Forney (full) Nov 27-91, *R & Eng*, (proportions), table, ed. *R Gaz* May 6-92; practice in Am. *Sc Am Sup* \* Nov 23-89

*The Eng* Am. practice \* May 3 \* June 21, July 19, 26, Sep 6-89 \* Jan 3, 31 \* Feb 28 \* June 6 \* Oct 17, and English, ed. Nov 7-90, trials, ed. Feb 27, vs. English, Dean, and ed. July 24, 24-91, Feb 26, Mar 4, 11, exhib. of, Apr 1, May 27-92

AM. Master Mechanics' Assoc. reports *R & Eng* July -90, pro (full) *R Gaz* June 19, 26-91, *The Eng* July 12-89. See also RAILROADS, Master Mechanics

BALDWIN, works erecting shop *R & Eng* \* Dec -90; No. 10,000 *R Gaz* \* Sep 27-89; Erie, 10-wheel express, inset \* June 13-90; varieties built, June 5-91; in New So. Wales (full) July 15, Aug 19, *The Eng* July 1, Sep 23-92

**Locomotives**, BALT. & Ohio, consol. *R Gaz* \* Aug 2, 30; pass.

\* Sep 6-**89**; 10-wheel, tests, ed. (full) \* Nov 27, 27 \* Dec 11 -**91**; 6-wheel switcher, inset \* July 22-**92**

BELGIAN, State R's, express pass., Paris exhib. *Eng* July 5, 5, *The Eng* \* May 3, 31, 31-**89**; goods, Paris exhib. \* Jan 24-**90**

BELL-ringer, steam *R Gaz* \* Mar 8-**89**; White's pneu. \* Aug 8 -**90**

BENGAL & No. W. R., India, and rolling stock, Rhind, insets *Inst C E* \* v 91 -**88**

BLAST, pipe, influence of intermediate tuyeres, Fliegner, abs. *Inst C E* v 91 -**88**, *Schweiz Bauz* Nov 5-**87**; nozzle, Adams' variable *R & Eng* \* Oct -**90**, *Eng*; pipes, Kordina's vortex *The Eng* Jan 20-**88**

BOILERS, strains in, Randolph *Am M E* v 9 -**88**;imps. in construct., Hickey *E News* \* Apr 4-**91**; construct. and effic., Sheffield *Inst C E* \* v 109 -**92**; *Locom* Nov -**88**; ed. *R & Eng* Oct -**88**; without stay-bolts, Bork \* May; expts. with, rate of combust., B. & O., temp. in smoke-boxes, Wells, ed. \* Aug -**90**

*R Gaz* water circulation, Hackney, Dec 28-**88**; grate areas proportions, ed. Apr 5; tubes length, ed. Nov 15; tube and rivet table, for spacing, Dec 27-**89**; C. B. & Q. experimental \* Jan 3; Leach, N. E. R. Club discuss. Apr 11; expts. with tubes of varying length, Paris, Lyons & Med. \* July 4-**90**

*R Gaz* stay-bolts, N. E. R. Club discuss. Mar 20; construct.imps., Hickey \* Apr 3; incrustation, treatment of waters used, Barr, Nov 13. discuss. Dec 4-**91**; stay-bolts in, Cole \* Jan 8; steel plates specs., Eastern R. of France, Feb 19; Phil. & Reading express, inset \* Mar 18; care of, in Algeria, Bates \* July 22 \* Aug 19; scale and feed water purification, Sep 30-**92**; Dean *Sc Am Sup* Feb 20-**92**, *Nat Car and Lo Bldr*

*The Eng* Leach's flexible stays, Feb 10-**88**; steel, Lond. & N. W., Webb \* Oct 18 \* Dec 6-**89**; experimental (compound tubular), Chemin de fer dl Est, France \* Nov 13-**91**; construct. \* Jan 1, 8 \* Feb 5; Leahy, cor. \* Apr 22; double, Eastern R., France \* Mar 4, 11; Great Western, converted \* Oct 21, 28-**92**

ALTOONA and Penn shops, notes, ed *E. News* Apr 26-**90**

BELPAIRE, and the radial stay, and ed. *R Gaz* \* Aug 1, cor. \*

Sep 26, 26-**90**; 62-in., Ill. Cen. \* Nov 20-**91**

CLEANER, the Trowbridge *R Gaz* \* Jan 17-**90**

- Locomotives**, EXPLOSIONS, remarkable, Atlan. & Pac. *E News* \* Jan 14-**88**; remarkable, Norwegian State R's \* June 7-**90**; on Brit. R's *R & Eng* \* Jan-Apr -**88**; in Europe *R Gaz* \* Jan 18-**89**; in France and Algeria *The Eng* Aug 31, 31-**88**, in France since 1840 *An Indus* July 29-**88**; France, Belgium, Holland and England *The Eng* Jan 11 \* Feb 1, 22-**89**
- FIRE-boxes**, the Darby crown sheet. Grand Trunk R., Can. *Eng* \* Aug 24-**88**; Webb's \* May 17, 17; corrug. steel, Lond. & N. W., Webb \* Aug 23-**89**; the steam-jet as a means for preventing smoke *E News* \* Apr 4-**91**; ed. *R & Eng* Jan; corrug. tubular. Knaudt. abs. June; fire-brick lined (full) \* Oct. Phelps, cor. Nov -**89**; corrug., Lentz, Apr-**90**; Forney's door opener \* June; corrug. \* Sep -**91**
- R Gaz* and coal burning, Higginson, and ed. July 20-**88**; Master Mechanic's com. report, June 27-**90**; staying, Woods, Apr 17; Hawksworth's door opener \* May 1; Ten Brinck fuel saving tests, Orleans R., France \* 8, 22-**91**, *Ing Civils*; Webb's steel *The Eng* \* June 14-**89**
- JOHNSTONE** compound *R Gaz* \* May 27-**92**
- KNAUDT** & Pohlmeier's, Prussian State R's *Eng* \* Oct 4, *R Gaz* \* Nov 15-**89**
- LENTZ'S** stayless *Eng* \* Dec 19, *R Gaz* \* Apr 4-**90** \* Jan 9-**91**
- SPEIRS'** construct. *E News* Jan 23, Dean, 30, (full) *R Gaz* Jan 22-**92**
- WOOTTEN**, U. Pac. express pass. *R Gaz* \* June 15 \* July 6-**88**
- BOSTON** & Albany 4-wheel switching *R & Eng* \* Nov. Dec -**91**
- BRAKE** gear diags., Am. Brake Co., cor. *E News* \* Jan 26-**89**
- BRISTOL** & Exeter express *The Eng* \* May 9, 9-**90**
- BUILDING**, Am., '88, n *Eng* Mar 8-**89**; in New So. Wales, June 6-**90**; in '89 *E News* Feb 1; 40 years' course of, French, inset *The Eng* \* June 20, July 18-**90**
- CAB**, Balt. & Ohio *R Gaz* \* Dec 16-**92**
- CALEDONIAN** R. bogie pass. *The Eng* Apr 13, 13-**88**; No. 123- performance, diags. \* Mar 13-**91**
- CANADIAN** Pac. 10-wheel heavy pass., inset *Eng* \* Jan 17, inset *E News* \* Aug 30-**90**; mogul. inset *R Gaz* \* May 31, inset *The Eng* \* June 21-**89**
- CAPE** Gov't. R's, coal burning of Colonial coal on, Stephens. insets *Inst M E* \* Jan -**90**
- CAVAN** R., light locom. *The Eng* Apr 20, 20-**88**

## 214 LOCOMOTIVES. CHESAPEAKE - COMPOUND

**Locomotives**, CHESAPEAKE & O. 10-wheel pass., Rogers works  
*R & Eng* \* July -90; tank switching, 2500 gals. *R Gaz* \* July  
 27-88

CHICAGO, Bur. & Q. pass., inset *E News* \* June 28; standard  
 mogul \* July 5 -90; suburb. pass., inset. ed. *R Gaz* \* Dec 13-  
 89; 75-ton decapod. Rogers works, inset \* July 24-91

CHICAGO, Mil. & St. P. express *R Gaz* \* Feb 20, details \* Mar 6-91

CLEVELAND, Cincin. Chic. & St. L. *R Gaz* \* Jan 1-92

COALING chutes *R Gaz* \* Dec 11, 18-91; coaling stations. Berg,  
 Feb 5 \* 19-92

COMPOUND *Eng E. Worthington*. Jan 11; Lapage \* Mar 22, 29 \*  
 Apr 5-89; English pats. on, abs., Feb 27, Apr 17-91; Sinclair  
*E News* Apr 20; Am. \* Nov 30-89; Am. Master Mech's com.  
 report. and ed. June 28, 28-90

*E & Min* compounding petrol. refuse burning, Russia,  
 Urquhart, abs. Sep 14-89, insets, discuss. (full) *Inst ME* \* Jan  
 -90; Lapage, discuss, insets \* Jan -89; the compound prin-  
 ciple applied to. E. Worthington, insets *Inst C E* \* v 96-89;  
 Polonceau, n v 99 -90; Brueckmann, abs. v 104 -91, *Soc Ing*  
*Civils* Oct -90; relative value of different types, abs. *Inst C E*  
 v 106 -91, *Am Mas Mech* 24th report

*R & Eng* 4-cyl., Bousquet, and ed. \* Mar -89; Master  
 Mech's com. report, July -90; development of compound sys-  
 tem. Mallet (full), Feb. ed. \* Mar - June -91; Webb, Jan;  
 early description, n \* June, ed. Sep -92, *F Inst*

*R Gaz* in Am. service, ed. \* Feb 15, 22; Sinclair, N. E. R.  
 Club discuss. Apr 19; May 10; starting power of, Neale, cor.  
 Aug 16; Barnes, discuss. Oct 18; India, Hughes \* Nov 22; ed.  
 \* Dec 20-89; mathematics of, French, Mar 7; Polonceaux, Apr  
 18; Master Mech's com. report, June 27; early, Perry & Lay \*  
 Sep 19-90

*R Gaz* pats. on (list), Feb 13, English \* 20; braking power  
 of steam cyls. of \* Apr 3; relative value of different types,  
 Master Mech's discuss. \* June 26; cyl. proportions. Oct 2; U. S.,  
 table, Dec 18-91; in frt. and pass. service, Woods, Jan 1; trip-  
 expan. n May 13; three-cyl. \* Dec 30; Master Mech's com.  
 report, abs. July 1, (full) *Ry Age* sup. June 24-92

*Sc Am Sup* compound prin. applied to locoms., E. Worthing-  
 ton, Mar 30-89; steam distrib. in, Snow \* May 10-90, *R Mas*  
*Mech*; comp. prin., Worthington *The Eng* Jan 25-89; cyls.,  
 Harrison, cor. \* June 6-90; Rickie, cor. Oct 23-91

**Locomotives**, COMPOUND, ARGENTINE Great Western. burning liquid fuel *The Eng* \* May 15-**91**

ARGENTINE Midland R. *The Eng* \* Dec 27, 27-**89**

AUSTRALIA, Baldwin, tests of Vauclain (full) *R Gaz* May 29 \* Aug 7-**91**

BALDWIN four-cyl. and ed. *R Gaz* \* May 2, 2-**90**; \* May 1, table, Nov 27-**91**. See also LOCOMS., comp., Balt.

BALTIMORE & O., Baldwin, details, inset *E News* \* May 3, 3, tests of and ed. Sep 6 \* 13, 13, narrow-gauge \* Dec 13; tests. Barrus (full), and eds. Sep 12, 12, 19 *The Eng* \* Sep 19, 26-**90**

BATCHELLER's pat. valve *R & Eng* \* May; R. I. Locom. works, Franklin Inst. medal *R Gaz* June 3-**92**

BROOKS two-cyl. *R Gaz* \* Nov 25-**92**

CHICAGO Mil. and St. P. tests, inset *R Gaz* \* Aug 5, 5-**92**

DEAN's *R Gaz* \* Nov 25-**92**

EAST Tenn. Vir. & Ga. indic. diag. *E News* \* Nov 22-**90**; ten months' test of, Dec 5-**91**

FRENCH *R & Eng* \* Aug -**89**; recent *R Gaz* \* Jan 3-**90**

GERMANY, in, Stambke *E News* \* Apr 19, May 3-**90**

GRAZI-Tsaritsin R. goods, petrol. refuse. Urquhart *The Eng* \* Jan 31-**90**

HUNGARIAN State R's *E News* \* Feb 6-**92**

JOHNSTONE's double truck, Mex. Cen. *E News* \* Aug 29-**91** \* Mar 12-**92**; abs. *Inst C E* v 106-**91**; Mex. Cen., tests (full) *R Gaz* \* May 22, 29, Oct 9; 10-wheel, inset \* June 5; trials anal., cor. Sep 25-**91**; double bogie, Mex. Cen., inset \* Mar 25, test \* Aug 26 (full) \* Dec 30, 30-**92**. See also LOCOMS., comp., Mex. Cen.

LAKE Shore & Mich. So. frt. *R & Eng* \* Dec -**92**

LINDNER's starting gear, system for *E News* \* June 16. do. *R & Eng* \* Dec -**92**, do. *R Gaz* \* Nov 15-**89**; do. in Russia \* Mar 13, 27-**91** \* Sep 2-**92** *The Eng* \* May 23 **90**

LONDON & No. W., Edinb. exhib., inset *Eng* \* July 25 **90**; Webb's. with Joy valve gear *E News* \* Jan 26-**89**; frt. *R & Eng* \* Feb; Webb's *The Eng* Dec 21, 21-**88**

MALLET's, Decauville R., Paris exhib. *Eng* \* May 3, do. *E News* \* June 1-**89**; largest and smallest *R Gaz* \* Aug 15-**90**; prog. in use of \* Feb 6, arguments pro and con, Polonceau, 13-**91**, *Ing Civils*; Paris exhib. *The Eng* \* May 24-**89**

**Locomotives**, COMPOUND, MEYER-Lindner duplex, Roy. Saxon St. R. *R Gaz* \* Sep 2-**92**

MEXICAN Cen. 10-wheel Johnstone's double truck, inset *E News* \* Aug 29-**91** \* Mar 12, inset (full) \* 26 \* Apr 2, valve motion \* 9-**92**; Johnstone, tests *R & Eng* \* June, n Aug-**91**, Nov-**92**, do. *R Gaz* May 29, Oct 9-**91**, test \* Aug 26-**92**

MEXICAN National R., dimens., news n *E News* Dec 13-**90**

MICHIGAN Cen., Schenec. works *Eng* \* Apr 4-**90** *E News* Jan 25, and ed. \* Mar 8-**90**; ed. *R Gaz* \* Jan 31, ed. Feb 14-**90**; 10-wheel pass. \* Jan 23-**91**

MISSOURI, Kan & Tex., and simple, comparative tests *R Gaz* Nov 11-**92**

NORTH Eastern R., England. express, Worsdell, inset *Eng* \* Mar 30 \* Apr 13-**88** \* June 21. 21-**89**; pass do. *R & Eng* \* May -**90**; tank engine *The Eng* Oct 26. 26, goods tank, Nov 23, 23-**88**; express, inset \* Feb 28 \* Mar 7-**90**

NORTHERN R. of France, goods, Paris exhib., inset *Eng* \* Dec 6-**89**; 4-cyl. fast pass., Bousquet, n *R & Eng* Jan \* Aug *R Gaz* \* Aug 12 *The Eng* \* Sep 2-**92**

PARIS, Lyons & Med. R. *The Eng* \* Aug 9-**89**

'PENN.' the *R Gaz* \* May 3-**89**

PITKIN's pat. *R & Eng* \* Mar -**90**

PRUSSIAN State R's, goods. Worsdell system, inset *Eng* \* Feb 1-**89**

RHODE Is. Locom. works, com. report, insets (very full) *F Inst* \* May -**92**; Batcheller. bk. review *R & Eng* Jan -**91**; test in express service, Jan -**92**; and simple, study of, expts. *R Gaz* \* Jan 9; system of (full) \* Dec 11-**91**

RUSSIA, petrol. fuel, Urquhart *Eng* Feb 7 \* 21 \* Mar 7, do. *E News* \* June 14-**90**

St. Gothard R., duplex *E News* \* Aug 15-**91**

St. Petersburg & Warsaw R., pass., inset *Eng* \* Sep 9, *R & Eng* \* Nov -**92**

SAXON State R's express, dimens. *R Gaz* \* Nov 22, 29-**89**

SOUTHERN Pac. *E News* \* Apr 28-**92**; 10-wheel, inset *R Gaz* \* Sep 11-**91**

SWISS, Jura-Berne-Lucerne R., pass. mogul, inset *Eng* \* Feb 7; *R Gaz* \* Sep 12-**90**

TESTS, Baldwin, Balt. & O. and ed. *E News* \* Sep 6, 13, 13; Union El. R., Brooklyn. in fast pass. service, Dec 27-**90**

**Locomotives, COMPOUND, TESTS**

\* Jan 3; 10 months, E. Tenn. Vir. & Ga. Dec 5, 12-**91**; Vauclain \* June 23, ed. 30, 30, indic. diag. \* July 7-**92**; Johnstone, Mex. Cen. *R & Eng* \* June \* Aug; W. N. Y. & Pa. R. Oct -**91**; R. I. works, in express service, Jan; Johnstone, Mex. Cen. Nov -**92**

*R Gaz* B. & O., Barrus, (full) Sep 12, 19-**90**; R. I. works expts. \* Jan 9; Johnstone's (full) \* May 22; Vauclain, May 29, \* Aug 7; Johnstone, trials anal., cor. Sep 25; and simple, comparative, W. N. Y. & Pa. Oct 2, Baldwin, Mex. Nat. Dec 4 -**91**; Johnstone, Mex. Cen. \* Aug 26; and simple, comparative, Mo. Kan. & Tex. Nov 11-**92**; comparative, Hudson *Sc Am Sup* Jan 23-**92**, *J Assoc E Socs*; B. & O. *The Eng* \* Sep 19, 26-**90**

VALVE gear, variable expansion, Dunlop, cor. *Eng* \* Feb 13-**91**; for Hope & Co., cor. *R Gaz* Sep 19-**90**

VAUCLAIN, 4-cyl. *E News* \* May 3-**90** \* Feb 20; tests \* June 23, ed. 30, 30, indic. diags. \* July 7-**92**; com. report *F Inst* \* July -**91**; patent, n *R & Eng* Jan -**90**; tests *R Gaz* May 29, Australia, Baldwin, tests \* Aug 7-**91**; Manitou & Pike's Peak rack R., n \* Aug 12-**92**

VON BORRIES', starting valve for (full) *R Gaz* \* June 12-**91**. See also LOCOMS., comp., Worsdell & Borries

WEBB's, Lond. & N. W., with Joy valve gear *E News* \* Jan 26, *Eng* \* June 7-**89**, *The Eng* Dec 21, 21-**88**

WOOLFE 4-cyl. double-expan., ed. (full) *R Gaz* \* Mar 8, 8-**89**

WORSDELL, N. E. R. express, inset *Eng* \* Mar 30 \* Apr 13-**88**; Worsdell & Borries' system, goods, Prussian State R's, inset \* Feb 1; N. E. R. express, inset \* June 21, 21-**89**, do. *R & Eng* \* May -**90**; applic. to Am. type of locom. *R Gaz* \* Dec 14-**88**; Grand Trunk R. \* Nov 6-**91**; Bengal R. *The Eng* July 20-**88**

WRIGHT'S *R Gaz* \* Jan 30-**91**

COMPRESSED air, 40 and 50 ton, Mekarski system, for Paris, France *E News* \* May 31-**90**. See also STREET railroads, compressed air motors

CONNECTING rods, side rods, N. W. R. Club discuss. *R Gaz* Nov 21-**90**; and crank pins, Chic. B. & Q. R. \* Jan 16-**91**; parallel rod resistance, Apr 8-**92**; *The Eng* May 25, June 22-**88**

**Locomotives**, COUNTERBALANCING, recip. parts, Lanza *Am ME* \* v 10-**89**; W. H. Lewis *E News* \* Apr 26-**90**; eds. *R & Eng* \* Feb - Apr -**90**; Hill *Inst C E* \* v 104 -**91**; Lanza *R Gaz* \* Oct 19-**88**; Booth, cor. \* Oct 11-**89**; in 3-cyl. compound, cor. and ed. \* Mar 21, review of, 21, Booth, cor. and ed., Apr 4; W. H. Lewis \* 25; Western R. club discuss. May 30-**90**, Barr discuss. do. \* Mar 6-**91**; expts. on methods, Lanza *Tech Q* \* Feb-**89**

CRANK-pin turning machine, Urquhart *Eng* \* Apr 12: at Paris exhib. \* Sep 27-**89**

CRANK shaft, expts. with, Ivatt *R & Eng* \* July -**91**, steel, test of, do. *The Eng* \* Apr 3-**91**

CYLINDER cock, Riggin's combination *R Gaz* \* July 4-**90**

CYLINDERS, design, Barker, inset *Inst C E* \* v 106 -**91**; steam action in at high speeds, ed. *R Gaz* Nov 22-**89**; proper capacity for pushers on grades, ed. \* Dec 19-**90**; means for increasing power at speed, ed. Oct 23-**91**; and slide valves. Lond. Br. & So. C. *The Eng* Aug 23-**89**

DELAWARE, Lack. & W. mogul frt. *R Gaz* \* Feb 3-**88**

DOUBLE end saddle tank, Porter *R Gaz* \* June 14-**89**

DOWNWARD draft, Complete Combustion Co. *E News* \* Aug 2-**90**

DRIVING-box linings, opinions, table *R Gaz* Mar 28-**90**

DRIVING-wheels, 'imperceptible slip,' Sargeant, C. B. & Q., tests of, table *E News* June 14; ap. for removing paint from, Horton \* Oct 11-**90**; Vauclain's centers, com. report *F Inst* \* July -**91**; big *R & Eng* Nov -**92**; size of express, ed. *R Gaz* Oct 26-**88**; 7½-ft. cast steel. N. E. R., England \* Mar 7-**90**; Vauclain's wrt. iron centers \* July 10-**91**; best size of, Greenhill *The Eng* Mar 29-**89**; polygonal \* Apr 4-**90**

DRIVING-wheel tires, Bess. steel, Arnold *Eng* Dec 7-**88**; wear of, cyl. wheels and flat-topped rails, Whittemore *E News* \* Feb 9, and ed. 16, 16, 23, ed. Mar 2; tests. Mich. Cen. \* May 11-**89**; retaining ring for \* July 19; hollow, dangers of in contact with frog points, Perry \* 26; breakages in Germany, Aug 9; steel, and attaching do. with different fastenings, Rhodes, Nov 8 \* Dec 6-**90**; irreg. wear of, Barr \* Feb 7-**91**, do., Herr \* June 16-**92**

*Inst C E* and rails wear on curves, Helmholtz, abs. v 93-**88**; Bess. steel, influence of chem. composition on strength, Arnold, discuss. \* v 95 -**89**; oil-gas tire setting ap., G. T. R., Wanklyn.

**Locomotives, DRIVING-wheel tires**

abs. v 104 -91; and axle specs., English *R & Eng* \* Aug; German fastenings \* Aug -91

*R Gaz* wear of, table, Master Mech's com. rep. June 22-88; steel, influ. chem. compos. on strength, Arnold, Mar 8-89; steel and Ross-Meehan shoe, N. E. R. club discuss. Oct 17; steel, attaching to center, Rhodes, Nov 7. fastenings, do. \* Dec 5-90; irreg. wear of, Barr \* Feb 6; wear, flat spots on \* Mar 20; steel, tests, Roussel \* Apr 3-91; stresses in, cor. Jan 22; irreg. wear of, Barr \* June 17; shrinkage of, table, July 15; wear, Herr, discuss. \* Oct 21-92

EASTERN R. of France, tank, Paris exhib., inset *Eng* \* Aug 30 \* Sep 20-89; Flaman boiler (compound), inset \* Mar 25 \* Apr 8, 22; fast *R & Eng* \* Mar -92; express experimental *The Eng* \* Nov 13-91; double-boiler express, inset \* Mar 4, 11 -92

ELECTRIC, Manhattan Elevated R., and steam. comparative tests, Moss, insets *Am C E* \* v 23-90; A. Siemens *El Rev Lond* \* Aug 12, do. results, City & So. Lond. R. *Eng* \* Aug 19, do. *E & Min* \* Sep 3-92; and steam, compar. tests, effic., Moss *E Rec* July 19, do. *The Eng* Aug 29, do. and ed. (full) *R Gaz* \* July 11, Moss, cor. 18-90; Weem's high speed, expts., Crosby (full) Mar 13-91; as substitutes for steam locoms., Woods, June 24-92; Daft, trial, N. Y. El. R. *Sc Am Sup* \* Mar 2-89

ENGINE drivers, hours of *Eng* Jan 30-91

ENGLISH, and Am. and ed. *E News* Aug 2, 2, discuss. Oct 11-90; use of truck on *R & Eng* \* Aug; express, Paris exhib. \* Nov -89 *The Eng*. See also LOCOMS., Am. and English—erecting

ERECTING *Eng* \* Dec 18-91; English *R Gaz* \* Sep 28; at Altoona *The Eng* Sep 28-88

ESTRADE's high-speed, Paris *Sc Am Sup* \* Apr 28 *The Eng* Mar 9, 9-88

EXHAUST, nozzle, Macallan's variable *Eng* \* Aug 22-90; muffler. Penn. R. *E News* \* July 21-88; pipe, Smith's triple-expan. Mar 16-89; pipes, nozzles, etc., Am. R. Master Mech's report \* June 20-91; nozzles, single and double, ed. *R Gaz* \* May 16 -90; pipes report \* June 19; nozzle, Mertsheimer's variable \* July 31-91; ap., common sense about, ed. \* June 17-92

FAIRLIE system, Mex. Cen., inset *Eng* \* Mar 14-90

## 220 LOCOMOTIVES, FEED—GREAT WESTERN

- Locomotives**, FEED water heater and purifier, Barnes' *E News* \* Aug 9 *R Gaz* \* July 25-**90**; purification, Northwest R. club discuss., C. N. Hunt, Dec 13, 20-**89**
- FIRE-boxes, brick arches in, Am. R. Master Mech's com. report *E News* Aug 9-**90**. See also LOCOMS., boilers, fire-boxes
- FIRE extinguisher, Penn. R. *R Gaz* \* July 19-**89**
- FREIGHT, hauling capacities, table *R Gaz* Nov 21-**90**
- FRENCH, Paris exhib. *R & Eng* \* Nov, pass. \* Dec -**89**; tank \* Feb -**90 Eng**; notes *R Gaz* \* Jan 16, 23-**91**; Chemin de fer d l'Ouest, express *The Eng* \* Oct 4, 11-**89**. See also LOCOMS., Eastern R. of France
- FUEL, premiums, Russia, Borodine *R Gaz* Sep 27-**89**; Yates' mileage card, Aug 1-**90**; petroleum, liquid fuel on *Eng* \* Oct 19-**88**, working of, Urquhart \* Feb 8, 15-**89**, do. tests *E News* \* Feb 2-**89**, burning \* Aug 25-**92**, do. Dudley *F Inst* \* Aug -**88**, in So. E. Russia, Grazi & Tsaritsin R., Urquhart, discuss., insets *Inst M E* \* Jan -**89 R & Eng \* Jan -**89**, on Great Eastern R., England, Booth *R Gaz* \* Feb 26-**92 Sc Am Sup** \* Nov 24-**88**, working with, Urquhart (full) \* Sep 27 \* Oct 4-**90**. See also LOCOMS., boilers, liquid fuel**
- FURNACE coal burning, Higginson *R Gaz* \* Nov 23-**88**. See also LOCOMS., boilers, fire-boxes
- GEORGIA Pac., 10-wheel *E News* \* Apr 5-**90**
- GLASGOW & So. West., pass., inset *The Eng* \* Mar 1, 22-**89**
- GRAND Central R., Belgium, tank, inset *Eng* \* Aug 16-**89**
- GRAND Trunk of Canada, express, inset *Eng* \* Dec 14, 21-**88 Sc Am Sup \* Feb 16-**89****
- GRANT works, Chic. *R Gaz* \* May 15-**91**, Cicero, Ill., inset \* June 17-**92**
- GRAZI-Tsaritsin R., So. E. Russia, 8-wheel *The Eng* \* Sep 4, 11, 11-**91**
- GREAT Britain and Ireland, number *The Eng* Sep 2-**92**
- GREAT Eastern R., England, express, inset *Eng* \* May 4-**88**, inset \* May 27-**92**, *The Eng* \* June 12-**91**
- GREAT Northern R., England, express *The Eng* June 8-**88** \* Nov 6-**91**, insets \* Dec 16, 16-**92**; of Scotland, pass., inset *Eng* \* May 23-**90**
- GREAT Western, England, broad and narrow gauge convertible, inset *Eng* \* July 8-**92**; works, Swindon *The Eng* Nov 16-**88**; early \* May 20, 27-**92**

- Locomotives**, HEADLIGHT, elec., Pyle's *El Wld* \* Sep 27-**90**, abs. *Inst C E* v 103 -**91**; elec. *R Gaz* Nov 29-**89**, Jan 17-**90**
- HIGHLAND R., Scot., standard pass., inset *Eng* \* Oct 9 *R & Eng* \* Dec -**91**
- HISTORY, the DeWitt Clinton, G. H. Thomson, inset *Am C E* \* v 23-**90**; old, the 'Sampson,' Robb *Am M E* v 10 -**89**; early, see H. Allen, v 11 -**90**; early, the steam buggy *E News* \* Sep 8-**88**; early, Horatio Allen \* Jan 11; the John Bull \* 18; hist. of development, ed. 18-**90**; Tomlinson, Pres. addr., insets. (full) *Inst M E* \* May -**90**
- R & Eng* \* Feb - Apr -**90**; Camden & Amboy R., Norris, n \* Jan -**92**; hist. of articulated, Brunner *R Gaz* Sep 25-**91** *Zeit Deut Eisenbahn*; early, Am. type and equalizing lever, Eastwick *R Gaz* \* Apr 22, 29-**92**; the rail, spike and locom., Watkins *Sc Am Sup* Dec 12-**91** *The Eng* \* Mar 7-**90**
- HOELLENTHAL R., inset *Eng* \* Feb 6-**91**
- HOIST, Chic. & No. W. *R Gaz* \* Feb 5-**92**
- HUNGARIAN State R's, tank *The Eng* Feb 3, 10-**88**
- ILLINOIS Cen. suburban, tests (full) *R Gaz* \* June 17-**92**
- INDIA, Sind Pishin section, Indian State R's *Eng* Apr 13 \* 20-**88**, inset \* Apr 19-**89**, 6-coupled, meter gauge *The Eng* Mar 23-**88**; Indian Midland tank \* Nov 22-**89**
- INDICATOR diags. at high speeds *E News* \* June 9, compound and ordinary, comparison \* July 7-**92**; indicating, Lyne, *R Gaz* \* Aug 2, Manning, cor. 16-**89**, do. Dean \* Feb 28; indicator cock, 4-way, Gifford \* Mar 7; diags., Worsdell's high speed compound \* Mar 28, No. E. R., England and ed. (and train resistance) 28-**90**
- IRON Range & Huron Bay heavy frt. *E News* \* June 16, 12-wheel, inset \* July 7-**92**
- ITALIAN pass. *R & Eng* \* June -**90**; Ital. Med. R. *The Eng* Nov 9-**88**, pass. \* Feb 1 \* Mar 29, goods, Sep 6 \* Dec 20-**89**, Paris exhib. \* Feb 21-**90**
- JAPAN Imperial R's tank, inset *Eng* \* Feb 10-**88**
- LAKE Shore & Mich. So. express, Brooks works (details), inset (full) *R Gaz* \* Nov 16-**88**
- LANCASHIRE & Yorkshire, England, pass., inset *E News* \* Mar 28; 6-wheel frt. *R Gaz* \* Jan 30; tender water-scoop \* Dec 25-**91**; standard goods, inset *The Eng* \* Jan 1-**92**
- LONDON, Brighton & So. Coast pass. *R & Eng* Sep, express pass., Paris exhib. *The Eng* July 19, 19-**89**

- Locomotives**, LONDON & No. W., Crampton engine, 1847, inset *The Eng* \* Nov 28-**90**; compound express \* Nov 20-**91**
- LONDON & So. W. works *The Eng* Sep 28-**88**; tank, inset \* Feb 5-**92**
- LONDON. Tilbury & So. tank *The Eng* \* Nov 25-**92**
- MANHATTAN Elevated R., N. Y. n *R & Eng* \* Jan -**90**
- MEDITERRANEAN R. *The Eng* \* Mar 13-**91**
- METROPOLITAN R., Lond., 4-wheel tank, inset *Eng* \* Dec 18-**91**;  
Met. Dist. R. pass. tank *E News* \* Mar 22-**90**, inset *The Eng* \* May 17-**89**
- MEXICAN Cen. (Fairlie system), inset *Eng* \* May 14-**90**; average econ., Johnstone, cor. *R Gaz* Nov 20-**91**
- MICHIGAN Cen. 10-wheel express *R Gaz* \* Feb 24-**88**
- MIDLAND R., England, express, inset *Eng* \* Mar 2, 16-**88**, exp. pass., Paris exhib. *The Eng* Sep 20-**89**
- MINERAL tank, Barry R. *Eng* \* Dec 2-**92**
- MOUNTAIN, two rack-rail, Abt system, Brunig R. and Riggenbach system, Brazil *E News* \* Nov 9-**89**. See also RAILROADS, mountain
- NARROW gauge frt., for So. Am. (meter gauge), Sharp Stewart, Glasgow *E News* \* May 17; compound, Baldwin \* Dec 13-**90**
- NEWPORT News & Miss. Val. 10-wheel frt. *R Gaz* \* Mar 16-**88**
- NEW So. Wales Gov't. R's, Baldwin 10-wheel *R Gaz* \* May 29-**91** *The Eng* Nov 23-**88** (full), July 1, Oct 14-**92**
- NEW York Cen. & H. R. 19 x 26 Brooks mogul, inset *R Gaz* \* July 23-**90**; suburban, inset \* Sep 11-**91**
- NEW York, L. Erie & W. express, inset *R Gaz* \* Jan 6-**88**
- NEW York & Northern. Rogers works, suburban service, n *R & Eng* \* Oct -**88**
- NEW Zeal. Gov't. R's tank, inset *Eng* Jan 29-**92**, do. for heavy grades, inset *E News* \* Nov 14-**91**
- NORTH Land. R. tank goods, inset *Eng* \* Oct 3-**90**, pass., inset \* Jan 9-**91**
- NORTHERN Pac. consolidation, inset *Eng* \* Oct 25, *Sc Am Sup* \* Dec 7-**89**
- OLD Colony R., simple and compound, tests, tables *R Gaz* Sep 16-**92**; pass., inset *The Eng* \* Nov 14-**90**
- OSCILLATIONS ap., West. R. of France *Eng* \* Jan 10; registering ap. *E News* \* Feb 8-**90**
- PENN. R. pass. *The Eng* \* Oct 17, 17-**90**

- Locomotives**, PHILADELPHIA & Reading heavy consol. *R Gaz* \* Jan 4-**89**; express \* Apr 15-**92**
- PIECE-work classification (full) *R & Eng* Jan — Mar -**92**
- PISTON, rod breakages, report *R & Eng* \* Nov; Am. balance piston *R Gaz* \* Jan 3-**90**
- PRUSSIAN *R Gaz* July 11-**90**
- RACK rail. See LOCOMS., mt; RAILROADS, mt.
- RAUB, the, n *The Eng* Dec 7-**88**
- RESISTANCE, engine and ed. *E News* Jan 5, 5-**89**
- REVERSE lever. Cumb. & Pa. R. *R Gaz* \* May 23-**90**
- RICHMOND works *R & Eng* \* Oct -**90**
- RUSSIAN heavy frt. *R & Eng* \* Sep -**92**
- ST. Clair tunnel decapod tank frt., inset *R Gaz* \* Apr 3, 10-wheel *The Eng* \* Apr 24 \* May 29-**91**
- ST. Gall & Garis mt. road R., Switz., inset *Eng* \* Dec 30, 30-**92**
- SANDING ap., steam *Eng* \* June 29, do. *R & Eng* \* Aug, do. *R Gaz* \* Sep 14-**88**; Leach's sand feeding ap. *E News* \* Feb 13-**92**
- SAXON State R., 4-cyl. compound *The Eng* \* Oct 23-**91**
- SCHENECTADY works *R Gaz* \* July 15-**92**
- SHAY, the, Gilpin Tramway, Col. *E News* \* Apr 26-**90**, inset *R Gaz* May 8-**91**
- SLIDE valves, friction of, Aspinall, discuss., insets *Inst C E* \* v 95 -**89** *The Eng* Dec 28-**88**; and cyls., Lond. Br. & So. C. R. Aug 23-**89**
- SMOKE-stacks, and exhaust nozzles design, W. H. Lewis *E News* \* June 23-**92**; cast iron *R Gaz* \* Apr 18-**90**; Manhat. eleva. R. \* Mar 4-**92**; straight, theory of, Snow *Sc Am Sup* \* Apr 13-**89** *Am Mas Mech*
- SOUTH Eastern R., England, express pass., Paris exhib., inset *Eng* \* Apr 25 \* May 2 *E News* \* Feb 22-**90**, inset *The Eng* \* Nov 29 \* Dec 13-**89** \* Jan 3-**90**
- SOUTHERN R., Italy, goods, inset *Eng* \* Oct 31-**90**
- SOUTHERN Pac. R., 8-wheel, diag. *E News* \* Apr 25-**91**
- SPARK arresters, Bell's *R & Eng* \* Mar; Brown's and smoke stack *R Gaz* \* Nov 14-**90**
- SPRINGS and equalizers, Master Mech's com. report *R Gaz* \* June 29-**88**
- STRONG, the, distrib. of steam in, Dean *Am M E* \* v 9-**88**, sup. v 10-**89**; inset *Eng* \* May 17, 17, cor. June 7-**89**; Strong Manuf. works \* June 6-**90**; remarkable run *E News* Apr 6-

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**89** *F Inst* \* Feb -**88**; steam distrib., Dean *R Gaz* May 25-**88**; the 'A. G. Darwin,' inset \* Jan 11; indic. diag. June 28 \* July 26-**89** *Sci Am* Jan 12-**89**; insets \* *Soc Arts Mass* -**88**; Tratman *The Eng* Sep 13-**89**

SWEDISH pass. *R & Eng* \* May -**88**

SWINERTON polygonal driving-wheel *E News* May 24, Swinerton, cor. June 28-**90**

TAFF Vale R. 10-wheel tank pass., inset *Eng* \* Aug 2, 9-**89**

TENDERS, Wabash R. *E News* \* Dec 1-**92**; truck, U. P. standard *R Gaz* \* Dec 7-**88**; axles, muck-bar, tests, Watertown arsenal. Howard (full) Jan 4; trucks, Hickey, Feb 22, Mar 1-**89**; iron frame, N. Y. L. Erie & W. \* Apr 18; heavy axles, Master Mech's com. report \* June 20; iron frame, Brooks works \* Nov 7-**90**; hopper, Wabash R. \* Nov 18-**92**

TESTS, and elec. motor, comparative tests. Manhat. El. R., Moss, insets *Am C E* \* v 23-**90**; standard method, prelim. report *Am M E* \* v 13; experimental, Goss \* v 13-**92**, do. *E News* \* May 19, 19-**92**; Penn. R. n Apr 26-**90**; expts., Donkin *Eng* \* Oct 21-**92**

*R Gaz* trials, Manning \* July 12, 19; in Chili, Stillman, Dec 27-**89**; standard method, Dean \* June 20, 27; testing, Manning, July 18; the calorimeter in testing, Barrus \* Oct 17-**90**; Baldwin 10-wheel, B. & O., ed. (full) \* Nov 27, 27 \* Dec 11-**91**

*R Gaz* Old Colony, table, May 27; standard, com. report (full) 27; Ill. Cen. suburban (full) \* June 17; simple and compound, O. Col., tables, Sep 16; Schenec. prelim. Oct 7-**92**; Am. performance, n *The Eng* Apr 20-**88**; trials, Chili, Feb 14-**90**; experimental, Goss \* June 3-**92**. See also LOCOMS., compound; RAILROADS. speed

TIRE testing machine, Chapelle works, Paris *The Eng* Jan 6-**88**

TRACK tanks, Balt. & O. R., Andrews *R Gaz* Oct 28-**92**

TRACTION, tractive power, diag. *E News* \* Sep 7-**89**; the Ries traction increaser \* Aug 9-**90**, ed. \* May 9-**91**; tractive power, n *R & Eng* \* Sep -**89**; how does it pull itself \* Apr -**92**; tractive force and train resistance *R Gaz* \* Oct 24-**90**, do. Slack *Steven's Indic* July 15-**88**; and driving, the mechanics of, R. H. Smith (full) *The Eng* \* May 13 \* June 3-**92**

TRALEE & Dingle R. narrow gauge *The Eng* \* July 15-**92**

VALVE, Child's cyl. *R & Eng* \* Jan -**89** \* May -**92**

- Locomotives**, VALVE gears, Bonnefond's *Eng* \* Dec 20-89, do.  
*R Gaz* \* Jan 17; Hunt's pat. *R & Eng* \* June -90; Rickie's,  
 Cawnpore st. R's, India *The Eng* July 6-88  
**WABASH** 10-wheel express, inset *R Gaz* \* Oct 17-90  
**WATERFORD** & Limerick R. *The Eng* \* Sep 12-90  
**WEIGHING** machine, Paris & Orleans R. *Eng* \* Nov 29-89  
**WESTERN** R. of France, Paris exhib. *Eng* \* Oct 18; tank \* Nov  
 22-89; pass., inset \* June 6, 13-90  
**WOOTEN**, the, com. report *F Inst* \* Sep -91; U. P. express  
 pass. (boiler) *R Gaz* \* June 15, details \* Oct 5 *The Eng* July 6  
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**Lock**, Havre transatlantic, iron gates, Widmer, abs. *Inst C E* v 92  
 -88 *An Pouts* \* v 14 -87. See also CANALS, locks  
**Lock-nut**, the Cluther *The Eng* Sep 28-88. See also TRACK,  
 lock-nuts  
**Locks**, elec. applic. to, Kintner *El Eng* \* Jan -88  
**Lockwood**, John, n *Am C E* v 27-92  
**Lockwood**, Thomas D., por. *El Wld* \* Sep 14-89  
**Lodge**, Oliver J., por. *El Wld* \* May 9-91, por. *Sc Am Sup* \*  
 Nov 1-90  
**Logarithms** *Pwr* Jan -92  
**Logger**, steam *Sc Am Sup* \* Apr 14-88  
**Logs**, loading on cars, M. C. B. standard *E News* \* Nov 1-90;  
 new proc. for comput. of, May 5-92  
**Logwood**, extracts testing, Palmer *F Inst* Apr -89; extractive  
 matter of, Macfarlane, Mar -90  
**London**, elec. lighting of, ed. *Eng* May 24-89; growth, *E News*  
 Aug 15-85; July 22-88; water Co's remarkable hist. Aug.  
 17-89; street traffic, July 5; smoke, value of, n Dec 6-90;  
 traffic, Howe report sup. Jan 2; Met. Gov't., ed. Apr 21; rapid  
 transit \* Nov 24-92, do., Reckenzaun *St R J* May -91; main  
 drainage report *The Eng* Mar 13-91; new streets between  
 Holborn and Strand, proposed, map \* July 15-92. See also  
 HYDRAULIC power distrib., Lond; PAVEMENTS; RAILROADS.  
 underground; SEWERS; WATER-works, etc.  
**Loring**, Charles A., por. *Cassier's* \* Dec -91  
**Louisiana** quarantine system, Holt *Sc Am Sup* \* Jan 7 \* Feb 4  
 -88  
**Loveridge**, Henry, por. *E & Min* \* Dec 13-90  
**Low**, Thomas B. *Inst C E* v 91 -88  
**Lubbock**, John, por. *Sc Am Sup* \* Mar 22-90

**Lubrication**, viscosity, detrs. of, Denton *Am M E* v 9-**88**, measurement of durability of lubricants, do. \* v 11-**90**, expts. with, do., Bissell, v 12-**91**, self-lubricating fibre graphite for machinery bearings, Cooper, v 13-**92**; friction of, Thurston *Cassier's* Oct-**92**; J. V. Wilson *Eng* \* Apr 20-**88**; anti-friction materials, Hedges, Aug 26-**92**; dry lubricants *E & Min* Aug 24-**89**; lubricating oil purifier *E News* \* June 21-**90**; the Holmes lubricant bearing, com. report *F Inst* Dec-**91**; measurement of durabil., Denton *Pwr* \* June; lub. oils exam., Stillman, Sep-**90** *Steven's Indic*; durabil. of lubricants, Denton *R Gaz* May 23-**90**; rationale of, Snowden, Feb 13-**91**; Barr, Dec 2-**92**; lub. oils, Charlier *Sc Am Sup* Nov 29 *The Eng* Oct 17-**90**; oils, ed. Sep 18-**91**. See also BEARINGS without lubs; FRICTION and lub; GREASE; OILS

**Luiz**, Dom I (King of Portugal) *Inst C E* v 100-**90**

**Lumber**, creosote, Fernandina works. Fla. *R Gaz* \* Nov 16-**88**; No. western traffic, Mar 25-**92**; cutting, circular saw or band, n *Sc Am Sup* \* Oct 25-**90**. See also WOOD

**Lunkenheimer**, Frederick, por. *Cassier's* \* Jan-**92**

**Lunn**, Robert W. *Inst C E* v 100-**90**

**Lyons**, John *Inst C E* v 101-**90**

**Machine**, moulding, Tabor *Am M E* \* v 13-**92** *Cassier's* \* July; design, æsthetics in, Barr, Aug-**92**; design, Unwin, bk. review *Eng* Apr 24-**91**; designing, intuition in, Hawkins *E Mag* July-**92**, do. *The Eng* Feb 15, 22-**89**; designing, Sweet *F Inst* \* Apr, do. *R Gaz* \* June 15, do. *Sc Am Sup* \* Apr 28 \* May 5-**88**; accident preventing devices, Cooper *Pwr* \* Dec-**90** *Am M E* v 12-**91**; construction, Richards, bk. review *R & Eng* Nov-**89**

**SHOPS**, Austrian regulations for *E News* May 31; slow burning construct., Boston Manuf's Mut. Fire Ins. Co. \* July 26-**90**; with weaving shed roof, Sweet \* Dec 15 *Am M E* \* v 13-**92**; France *R Gaz* May 2; framing, Wilmerding, Pa., Westinghouse \* Apr 11, June 6-**90**; Link Belt Machine Co. \* Apr 24-**91**

**STOKING**, Spencer, discuss., insets *Inst C E* \* v 104-**91**. See also STOKERS, mechan.

**TOOLS**, mod., Dixon *Eng* Feb 3 *The Eng* Jan 20-**88**; power used by, n *E News* July 19-**90**; indic. diagrs. from, Breckenridge *Lehigh Eng J* Oct-**88**. See also Shipyard machine tools, etc.

**Machinery**, The Mechanics of, Kennedy, bk; tight set-screws in. Cooper, discuss. *Am M E* -88; miscel., Roy. Agric. Show, Nottingham *The Eng* July 20; use of in construction. Price, Oct 26; sale of old, Sharp, Stewart & Co. 26-88; old, sale prices. July 19-89

**Machines**, accident preventing devices applied to, Cooper *Am M E* v 12 -91 *Proc* \* Dec -90. See also AUTOMATIC—SLOT machines

**Mackensie**, John *Inst C E* v 106 -91

**Mackintosh**, Alexander *Inst C E* v 101 -90

**Macnab**, Alexander *Inst C E* v 104 -91

**Macy**, Arthur, por. *E & Min* \* May 9-91

**Magheramorne**, Lord *Inst C E* v 101 -90

**Magic** lantern. optical projection, Wright, bk. review *Eng* Dec 4 *The Eng* \* Nov 13 \* Dec 25 -91

**Magnesite** as a refractory material, Sorge *E & Min* Jan 16 -88

**Magnetic**, circuits and measurements, Du Bois *El Rev Lond* \* Oct 9; induction, molecular proc. in, Ewing (full) *Sc Am Sup* \* Nov 14; reluctance, Kennelly (full) *El Wld* \* Nov 7, discuss. 21, (full) *El Rev* \* Nov 7-91; fields, graphic representations, Houston \* Sep 3-92. See also ELEC. magnetic

SEPARATORS *E & Min* \* Nov 5-92; Paris exhib., Hering *F Inst* \* June; Hall, cor. *The Eng* \* July 18-90

BALL & Norton electro-, Ball *Am Min* \* v 19-91 *El Eng* \* Oct 8, Monarch *El Rev* \* Oct 11-90

BUCHANAN'S ore *E & Min* \* Mar 10-83 \* June 15-89

CHASE iron ore *E & Min* \* July 2 *E News* \* Sep 1-92

EDISON'S, n *E & Min* \* Dec 8-88 *Sc Am Sup* \* Jan 12-89

HOFFMAN *E & Min* \* Dec 12-91

LOVETT-Finney iron ore *E & Min* \* Nov 21-91

MONARCH ore *El Rev* \* Oct 11. Ball *El Wld* \* 11 *E & Min* \* Sep 6, Ball *The Eng* \* Dec 5-90

VENSTROM *E & Min* \* Nov 24-88

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**Magnetism**, relation to induced elec. mo. force and cur. E. Thomson *El Rev Lond* \* June 21-89; Hopkinson \* Jan 17, 31-90; and recalescence, do. *El Wld* \* Dec 20-90; Ewing's theory of, Crew *F Inst* \* Aug, Hoopes *El Wld* \* May 16; elec., galvanism and the telegraph, chronol. hist., Mottelay (very

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full) \* Apr 18-**91** — Feb 27, Sep 3, pors. 10 — \* Oct 22 — Dec 31 -**92**, etc.

*Sc Am Sup* influence upon crystallization, Decharme \* Mar 31; protection of watches against, Woodbury, Oct 20-**88**; curiosities, Bidwell (full) \* July 6; relation to induced elec. mo. force and cur., E. Thomson (full) \* Aug 17-**89**; Hopkinson (full) \* Mar 1, 8-**90**; recent prog. in Giles, Dec 26-**91**; wave propagation of. Trowbridge, July 2-**92**; Hopkinson *The Eng* \* Mar 7-**90**. See also ELEC. magnetism

**Magnetite**, crystalline, in Port Henry, N. Y. mines, Birkinbine *Am Min* \* v 18-**90**; Ontario, Ledyard, discuss. v 20, So. W. Va., Nitze, v 20-**92**; concentrating with Conkling jig at Lyon Mt., N. Y., Ruttmann *E & Min* \* June 9-**88**

**Magnets**, permanent, character of steel used for, Preece (full) *El Rev Lond* \* Sep 12-**90**, S. P. Thompson *El Rev* Aug 8 *El Wld* \* Aug 1, 8, 22-**91**. See also ELEC. magnets—magnetism, etc.

**Magnolia** metal for machine bearings, R. H. Smith report *The Eng* \* Dec 20-**89**

**Main**, John F. *Inst C E* v 110 -**92**

**Malaria**, malarious districts, treatment of *Eng* \* Mar 2-**88**; Celli *Sc Am Sup* \* June 27-**91**

**Malt** drying vac. stove *Sc Am Sup* \* June 30-**88**

**Man**, evolution in civilized, Powell *Sc Am Sup* Apr 7-**88**; effects on strength of injections from liquid from animals, Brown-Sequard, Aug 10. Brown-Sequard discov., Stockwell, Oct 19-**89**; man's upward struggle, Aaron, Aug 13; cerebro-spinal axis as a thermal center and power, Richardson, Oct 1-**92**. See also MEN

**Manganese**, manganese-steel, Howe *Am M E* \* v 12-**91** *E News* \* June 20-**91**; ores, argenterous, Tombstone dist., Ariz., Goodale (supplementary) \* v 18-**90**; ore deposits, Crimora, Va., Hall *Am Min* \* v 20-**92**; steel *El Rev Lond* Aug 10, do. Hadfield *Eng* Mar 9, Sep 7, 21-**88**

*E & Min* Santiago de Cuba mines, Reimer report, Nov 24-**88**; the Reymert manganiferous lode, Ariz., Blauvelt, Feb 9-**89**; the Crimora mine, Va. \* Mar 22-**90**; ores, U. S. produc., Weeks, Cen. bull. May 23; distrib. in No. Am., Penrose, Aug 1-**91**; metallic, Bullock. n *F Inst* July -**89**; bronze *The Eng* \* July 25-**90**

**Manual** training, education for the workshop, Perrine *E Mag* May; man. training-kindergartens, Plunkett *Pop Sci* July -92

**Manufactures**, time and cost keeping, Binsse *Am M E* v 9-88; manuf'g industries net profits, ed. *Eng* Oct 9; practical prime cost, ed. Dec 4, 11-91; in U. S., growth, n *E News* Oct 11; industries stats., ed. *E & Min* Aug 2-90; and arts, review of prog. *F Inst* Feb -88; English manuf's in U. S., Siddell *The Eng* Nov 14, 21-90; Am., recent growth, Nov 25-92. See also INDUSTRIAL Co's

**Maps**, in relief, construct., Harden *Am Min* \* v 16-88; mercator chart drawing on one sheet, Kelvin *El Rev Lond* \* Sep 30-92; of ordnance survey, Scot. Highlands *Eng* Jan 6, 20 \* Feb 3, 17 \* Mar 2, 16, 30 \* Apr 13, 27 \* May \* June 1, 15, 29-88; pocket mapping instrum., Lane *E & Min* \* Apr 12-90

*E News* plotting contours, Lorimi, diag., cor. \* Feb 23; making topog. relief maps, cor. 23-89; Gov't., scale of, in Europe, n Dec 19-91; topog. lettering and marking ap., n Feb 6-92; mapping of the world *R & Eng* June -91. See also MINING maps; SURVEYING, topog.

**Marble** quarrying, U. S., Morse *E Mag* Oct -91. See also RAILROADS, Carrara-Marble District

**Marillier**, James C. *Inst C E* v 102 -90

**Marine** engineering, development and prog. during past 15 years, Seaton *Am Min* v 19 -91; *Eng* Nov 14-90, Jan 16-91; submarine gullies, Webb *El Rev Lond* Feb 24; concrete for marine constructions *Eng* July 20-88; some details in, Mudd, Apr 10 *The Eng* \* Apr 10; eng. during last decade, Blechynden, July 31, Aug 7, insets (full) *Inst M E* \* July *Sc Am Sup* Sep 19, 26 *Eng* July 31 \* Aug 21, Sep 18; practice 40 years ago, Denny, June 26-91; and ship-building in '92, Dec 23-92

*E News* Brit. and Am., ed. Jan 26-89; Vivarttas *R & Eng* July \* Aug -91; casualties, causes *Sc Am Sup* Aug 13; Capt. of the 'Mary Rose,' Clowes \* Sep 17, 24-92 *The Eng* Glasgow exhib. Aug 10-88; and naval architecture at Edinburgh exhib. July 18, Oct 17-90. See also BOATS; FERRY-boats; HARBOR eng; LAUNCHES; LIFE-boats; NAVAL eng; NAVIES; SCREW propellers; SHIPS; STEAMBOATS; STEAMERS; TORPEDO boats; YACHTS, etc.

**BOILERS**, Babcock *Cassier's* \* Jan -92; working and test pressures, Sennett *Eng* Mar 30 *The Eng* Mar 30-88; corrosion, Dodds, May 3 *Eng* Mar 29-89; double shell, Casebourne, Jan

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3; distrib. of evap. in, Stromeyer, Apr 11; furnaces, Kilvington, June 27-**90**; short. strength of \* Apr 17, cor. \* May 15-**91**; (navy) ed. Mar 18; failure of, ed. May 20; treatment, W. Wilson, Oct 21, Nov 4. 11-**92**

*E Mag* mod., Willits \* June -**92**; Walters *Pwr* Dec -**89**; tubulous, Leonard *R & Eng* \* July \* Aug \* Nov - **90**, Thwaite \* July; high pressure \* Mar -**91**; adaptation of steam machin. in marine construction, Emery (full) *Sc Am Sup* Jan 18. 25-**90**  
ALFONSO XII str., inset *Eng* \* Feb 15 \* Mar 1 - **89**  
ALMY water-tube, Normand's *Cassier's* \* Sep *R & Eng* \* July -**92**

AUSTRALIA, Am. Pacific str. *The Eng* July 19-**89**

BABCOCK *Cassier's* \* Jan -**92**, Babcock & Wilcox water-tube *Eng* \* May 22-**91**

BARHAM and Bellona S. S., insets *Eng* \* Nov 28 \* Dec 12, 12-**90**

CARSON, the, n *R & Eng* \* May -**91**

CALORIC str., compound *Eng* \* Aug 23-**89**

CITY of Dundee str., inset *The Eng* \* Feb 26 -**92**

EDGAR, H. M. S. *Eng* \* Jan 1-**92**

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**Pagan**, John *Inst C E* v 96 -89

**Paine**, William H. *E News* Jan 10, por. *St R J* \* Feb -91

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- ASPHALT, *E News* Jan 21; in Berlin, Hering, Dec 15-**88**; rock asphalt, N. Y. Sep 28; on concrete, N. Y., Nov 16-**89**; in N. Y., Gilroy report, May 5-**92**; Lond. asphalt, cost of maintaining *E Rec* Jan 18-**90**; Wash., D. C., details (full) Feb 14; laying, Berlin, Germany \* Dec 19, 26-**91**, Jan 2-**92**. See also ASPHALT
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- BRICK, and brick manuf., Calkins, insets *Am C E* \* v 26-**92**; st., Kent *E & Min* June 21-**90**; Billingsly *E News* Feb 2; Ryan, June 15, 29; Hale system of \* Aug 3; discuss. Dec 21-**89**; fire-brick, Culley, notes \* Mar 1, spec. 8; Nebraska City, spec. Mar 29; tests of, Potter, June 21; bricks and, Chase, July 19 \* 26-**90**; tests, Butts \* Apr 11-**91**; tests, table *E Rec* May 2-**91**; Burlington, Iowa, spec. Feb 27; fire-clay, Cleveland, O., specs. Apr 16-**92**; st., Sargent, abs. *Inst C E* v 91-**88** *J Assoc E Soc*s-**87**; slag brick paving, Wright *Lehigh Eng J* Feb-**89**. See also BRICK
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- DULUTH paving imp. and sewerage *E Rec* \* June 28-**90**
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- HALE, the *E & Min* \* Jan 25-**90**; system of brick *E News* \* Aug 3-**89**
- IRON and oak combination, Cole *Am M E* \* v 13-**92**
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- TELFORD-Macadam *E News* \* Sep 7-**89**
- WOOD as material *E News* Sep 8-**92**

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**Peto**, Samuel M. *Inst C E* v 99 -**90**

**Petroleum**, and natural gas in N. Y. state, Ashburner, inset maps (full) *Am Min* \* v 16 -**88**; crude as fuel for raising steam at So. Chic. works, Potter, coal vs. oil in puddling furnace, Billings, oil as a metallur. fuel, Felton, v 17, 17-**89**; Racine system of burning crude oil *El Wld* \* Apr 6-**89**; Russian transport., ed. *Eng* Jan 20 \* Feb 3-**88**; storage, Carrington, Apr 10; as the future fuel of the Pac. Coast, May 22-**91**

*E & Min* petrol. and its cognates, Hoefer, bk. review, Aug 4 -**88**; market review '87, Jan 7-**88**, Jan 12-**89**, '89, Jan 4-**90**, Jan 3-**91**; origin, Hoefer, May 16; U. S. produc., Weeks, Cen. bull. June 20-**91**, '91 and market review, Jan 2-**92**; burning, Aerated Fuel Co's system *E News* \* Nov 30-**89**; oil fuel, Minneap. water-works, July 28-**92**; transport., U. S. *E Rec* July 26-**90**; Russian and Am., Sadtler, map *F Inst* \* May -**88**

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*Inst C E* petrol. gas of Trenton limestone. Ohio, Orton, abs. v 104 -91 *U. S. Geol. Survey* v 2 -90; storage installs. at Avonmouth and Cardiff, P'ickwell, insets *Inst C E* \* v 104 -91; reception and storage of refined in bulk, Carrington, discuss., inset (full) \* v 105 -91; as fuel, Bost. & A. R., Springfield, Mass., expts. *Lehigh Eng J* Apr -88

*Sc Am Sup* petrol. launch Zephyr \* Aug 18 -88; (molec. structure of matter) Anderson, Nov 23 -89; refining and lub. oils, n Aug 15; origin, Ross, Nov 21 -91; solidification expts., Rideal, Mar 26 -92; petrol. ships, ed. *The Eng* Oct 26 -88; liquid fuel ap., Great East. R., Holden's system \* May 15 -91; Root's launch motor \* Sep 30 -92. See also FURNACES, liquid fuel; LOCOMOTIVES, boilers, fire-boxes; WELLS, petrol.

**Petroleum** engines, W. Robinson *Eng* \* Oct 2, 9 *The Eng* \* Sep 11, 18 -91; Unwin, Mar 11 *Eng* Mar 11 Robinson \* 11-25, Unwin, discuss., inset (full) *Inst C E* \* v 109 -92; Durley \* v 110 -92; 3-cyl., Muller, abs. v 100 -90 *Genie Civil* \* v 16 -90; motor *Sc Am Sup* \* Sep 27 -90; spirit engines *The Eng* June 15 -88

BRAYTON, the *Cassier's* \* Aug *Eng* \* July 15 -92

BUTLER'S motor *The Eng* \* July 25 -90

GRIFFIN'S oil engine *The Eng* \* Dec 2 -92

PRIESTMAN'S *Eng* \* May 18 *E News* \* Nov 17 -88, Sep 1 -92; and Hornsby-Akroyd *The Eng* \* Sep 25 -91

SPIEL'S, etc., performance, n *The Eng* Aug 31 -88

TRUSTY, the, n *Eng* \* Dec 2, portable *The Eng* \* Dec 9 -92

YARROW'S *The Eng* \* May 25 -88

**Pettit**, William F *Inst* Apr -89

**Phelps**, George M., por. *El Eng* \* June -88

**Philadelphia**, map *Eng* \* Mar 9, 16 -88; mayor's message, *Fitler E News* Oct 12 -89; pub. works, Aug 2 -90; st. cleaning '91, n Nov 10; as a seaport, Mahan *E Rec* Apr 23, 30 *F Inst* Mar, Apr; port of, Haupt, Jan -92. See also FIRE protection, Phila. fires; MUNIC. eng; PAVEMENTS; SEWERAGE; STREETS; WATER-works, etc.

**Philbrick**, Edward S. *E Rec* Feb 23 -89

**Phillips**, Alfred *Inst C E* v 97 -89

**Phipps**, George H. *Inst C E* v 96 -89

**Phipson**, Wilson W. *Inst C E* v 108 -92

**Phonograph**, the new talking machines, Edison's. Hubert *Atlan M* Feb -89; graphophone, Tainter *El Rev Lond* \* Aug 3 *El Wld* May 19 (full) \* July 14; Gilliland \* May 19 *El Rev* \* May 19. Edison, June 16 *No Am Review* June -88; and micro-graphophone, Bleyer *El Rev* \* May 23-91

*El Wld* gramophone records, Houston, July 14, Berliner's \* Aug 18; some possible forms, O. Smith \* Sep 8, Hunter, n 22 -88; Bettini's micro-graphophone \* Apr 26-90; Edison's, ed. *Eng* Aug 17 \* Sep 14, 14-88; expt. \* Mar 15-89; phonos. and graphophones (full) *E & Min* \* Sep 15-88

*Sc Am Sup* Edison's new \* Feb 11; and graphophone (full) \* Oct 27-88; Edison's \* July 13-89, Johnson, Mar 29-90; Larranaga's photo-phon., Maier \* Feb 6-92; and phonographophone, Vaughan *Soc Arts Mass* -89. See also GRAMOPHONE; GRAPHOPHONE

**Phosphates**, slag, Phillips *Am Min* v 17-89; commercial, list of, Adams, v 18-90; indus., n *E Mag* Aug *E News* July 18-91, of Fla., Wilson, insets *E Mag* \* Oct -92, do. beds, Ledoux *E & Min* Feb 8, notes, Wyatt, Aug 23-90; So. Car. phos. rock market '90, Jan 3; deposits, Fla., notes on geol. of, Darton, Feb 14, do. origin and deposition, Davidson, May 30; of Am., Wyatt, bk. review, Nov 14; Fla. fields, notes, Adams, 21, 28, Dec 5, 12-91, do. U. S. produc. '91, Jan 2; Fla., mining, do. \* 23 \* Feb 13, Pratt, Apr 2; So. Car., mining, Benedict \* Mar 26; beds of Maltese Islands, Cooke \* Aug 27-92

*E News* indus., n July 18; phosphate of lime produc. July 11 -25-91; report, Terne *F Inst* Dec -92; beds of Fla., Ledoux *Sc Am Sup* July 12-90, deposits, Darton, Mar 14, origin and dep., Davidson, July 25-91; So. Car., mining, washing and calcining, Benedict, Apr 16; Fla., Pratt, 30-92

**Phosphorus**, rapid method of det. in ores, Woodbridge *Am Min* v 17-89; in pig-iron, steel and iron-ore, C. Jones, in cast iron, Keep, distrib. in Hudson river carbonates, Olmsted \* v 18, 18-90; the glow of, Thorpe *Sc Am Sup* Aug 9-90; manuf. by electricity, Readman-Parker proc. Oct 3 -91 *Chem Tr J*

**Photography**, of coal mine interior, Dewey, insets *Am Min* \* v 16 -88; applics. to sci. purposes, Wood *Eng* Mar 30; stereoscopic, Stroh \* May 4-88; prog., Abney, Oct 4-89

*F Inst* recent advances in, Ives, May; chlorophyl and gelatine-bromide plates, do. \* June; substitute for glass, Carbutt, Dec -88; heliochromy, Ives, Jan, n Nov; amateur, in its educa-

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tional relations, Himes, May; substitution of gelatine for collodion, com. report, Sep; lenses, focus of, Cheyney \* Nov -89 \* June; proc. without metallic salts, Dec -90

*F Inst* in the colors of nature, Ives, Jan; heliochromy, Prof. Lippmann's, do. Aug -91; *Locom* Sep -89; in natural colors, Feb -90; surfaces feebly sensitive to light, Osborne *Sci Am* Jan 19-89

*Sc Am Sup* platinotype proc., Gunther, Jan 21, Willis, May 12; gold and silver salts making, camera, Feb 4; plates, flex. substitutes for \* May 5, manuf. \* 26 \* June 9; stereoscopic \* 9; stellar, Holden, July 28; transferring and coloring, on glass, Ashman, Aug 4; negatives, Rau, 11; notes, Sep 8; instantaneous, Howland, Oct 6; notes, 6, 13, objectives, Bausch, Nov 3, 10, Dec 8; printing plates, Nov 17-88

*Sc Am Sup* engraving on glass, Duchochois, Jan 26; the inventors of \* Feb 16; lenses, Beck \* Mar 30; the law and, Cooper, Apr 20; making dry plate emulsions, Lyon, May 4; orthochromatic, Litzkow, Aug 17; aut. ap. \* Dec 21; heliochromy (colored pictures), Oct 5, Ives n *F Inst* Nov -89

*Sc Am Sup* pictures distorting, Wallace, Mar 1; platinotype printing, Mar 1; composite, Batut \* Apr 5; a new photographic eye, Flammarion, May 3; ap., Lick observ., Holden \* Aug 16; image, Meldola, Sep 13; the Primuline printing proc. Dec 20 -90

*Sc Am Sup* tele-photog. (elec. transmiss. of pictures), Sutton \* Jan 24; in colors of nature, Ives \* Mar 14; in aniline colors, Green, May 2; aut., Enjalbert ap. \* 30; work of Herschel and Fox Talbot, Lang, Aug 15; postage stamp photos. \* 15; printing processes, Bothamley, 15; applics. of, Rayleigh \* 29; upon a black background \* Oct 24, 31; photographic chemistry, Meldola (full) Oct 24, 31, Nov 7; kite \* Nov 7-91

*Sc Am Sup* telescope lens, Dallmeyer \* Apr 9; notes \* May 7; composite heliochromy, Ives (full) July 2; photos. untrustworthiness \* Dec 17-92; of solar prominences, Hale *Tech Q* Nov -90

*The Eng* Crystal Pal. exhib. Mar 2, 9-88 \* Apr 5, 19 \* May 10-89; Marion & Co's works, Apr 20, May 4; Swain's photographic works, June 8-88; B. Edwards & Co's photographic dry plate works \* Mar 8-89; in natural colors, May 29, June 12; illum. of developing rooms, Aug 14; recent aids

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to science, Sep 18, Oct 9-**91** ; Camera Club conference \* Mar 25 ; photos. (distortion) \* Nov 4 ; curious phenomena and applics. Dec 16-**92**. See also CHRONOPHOTOGRAPHY

KINETOGRAPH, the Edison *El Eng* \* June 24-**91**, Lathrop *Harper's W*

**Photo-etching**, intaglio plates, method *Sc Am Sup* Dec 28-**89** ; on copper plates. Nov 1-**90**

**Photogrammetry** *Sc Am Sup* \* June 15-**89**

**Photo-intaglio proc.**, Levy, inset *F Inst* \* Nov -**92**. See also PHOTO-etching

**Photo-lithographic transfers**, Wilkinson *Sc Am Sup* May 11-**89**

**Photo-mechan. processes**, Koehler (full) *Tech Q* Oct -**92** ; Waterlon's mechan. works *The Eng* Oct 5, 5, 19-**88**

**Photo-micrography**, imps. in. Zeiss ap. *E News* \* Jan 2-**92** ; Pringle *Sc Am Sup* Oct 4-**90**

**Physicians** to Crown Prince of Germany, pors. *Sc Am Sup* \* Feb 4-**88**

**Physical**, National laboratory, Webster *El Wld* Aug 6-**92** ; ap., economical, Ince *Sc Am Sup* \* Dec 13-**90** ; science. See also GRAVITATION ; MOUNTAINS ; OCEAN ; SCIENCE

**Physies**, Elements of (dynamics), Fessenden, bk., Macmillan, Lond. '92 ; precision of measurements, Holman, discuss. *Tech Q* Dec -**87** \* May, (very full) *El Eng* Feb, May, July, Sep -**88** ; law of inverse square, Wolcott, Nov -**89** ; Physical Soc., flow in a strained elastic solid, C. Wilson *Eng* \* May 16-**90** ; pendulum measurements *Locom* Jan -**90** ; absolute zero, Aug -**92**

*For* what is a vacuum \* Dec -**89** ; stresses produced by sudden forces and shocks, Merriman *R & Eng* Dec -**89** ; instability of solids, ed. May -**90** ; expts. in. Hopkins *Sci Am* Feb 2-**89** ; superficial tension expts. *Sc Am Sup* \* Sep 8-**88** ; Van 't Hoff's law of osmotic pressure, Carnegie \* May 16-**91** ; expts. upon surface films, Rayleigh \* June 11-**92** ; regulator for maintaining constant exhaustion (gases in capillary tubes), Holman *Tech Q* \* Sep -**87**

**Physiography**, diametral, Kalakaua *Eng* \* Feb 24-**88**

**Physiology** of good and evil, Richardson *Sc Am Sup* Dec 14-**89**

**Piercy**, Benjamin *Inst C E* v 96-**89**

**Piers**, iron coal-pier, Norfolk & West. R., Va., Coe, *E Rec* \* Oct 29, discuss., insets; iron wharf, Fort Munroe, Va., Duncklee, discuss., insets *Am C E* \* v 27, 27 -92 *E News* June 30; new, Southampton, Lemon *Eng* \* Sep 2-92; pier head at Marine Park, Boston *E Rec* \* Sept 21-89; on soft ground Ripley \* Mar 29-90; iron ice pier, Newcastle, Del. \* Apr 23-92

*Inst C E* compressed air foundations, Rochelle, La Pallice har., Thurninger, abs. v 100 -90 *An Ponts* \* Nov -89; No. and W. coast, Scot., Barron, inset *Inst C E* \* v 99 -90; subaqueous part of, method of construct., Kidd \* v 105 -91; and pile abutments, Jameson *R & Eng* \* Feb -90; promenade pier, St. Leonards-on-sea *Sc Am Sup* \* June 23 *The Eng* May 11, 11-88; at Brighton \* Jan 29 \* Feb 12, old chain pier \* Mar 4-92. See also BRIDGES; HARBOR eng; PILES; TRESTLES

**Pig-iron**. See IRON, pig-iron

**Pile-driving**, uniform practice in, Crowell *E News* Dec 29-88, (full) \* Oct 27, Nov 3, 17, discuss., inset (full) *Am C E* \* v 27, 27 -92; factors of safety *E News* Dec 29-88, ed. Apr 6; formulas, Trautwine, cor. Mar 16, May 11; South st. bridge, Phila. \* Oct 19, 19: cost of, Baker, Dec 14-89

*E News* and ditching plant, Om. & St. L. R., inset \* Aug 16 -90; formulas, Husten, cor. and ed. Aug 25; safe load for piles, ed. Nov 17; pile-driving experience, Howe cor. Dec 8-92

*E Rec* pile driver and adjustable derrick \* Nov 9-89, revolving hydr. \* Apr 4; driving, Adams, July 25; a pendulum pile driver \* Dec 5-91; driving, Jameson *R & Eng* Oct -89; triple row driver *The Eng* \* May 8-91

**Piles**, allowable load on, Haagsma, cor. *Eng* May 6; pile and trestle timber structures, Western Am. R's, inset \* 20-92; safe bearing load, formulas, Trautwine, cor. and ed. *E News* Dec 29-88, Jan 19-89; sinking, jet and screen dike, Missouri river com. \* Dec 6-90

*E Rec* pile bridges cost of repairs, Talbot Sep 20-90; abutments and piers, Jameson *R & Eng* \* Feb; preservation, McIntosh, June -90; safety of pile bridges *R Gaz* Apr 26-89, and trestle, Minneap. & St. Louis, Hixon, cor. \* Apr 17, deep water R., Halifax har. \* Dec 25-91; protection (cost), Pritchard *Sc Am Sup* Mar 1-90. See also BRIDGES; BUILDINGS; FOUNDATIONS; HARBOR eng; PIERS; TRESTLES

**Piling**, sheet, clamp for, Emery, inset *Am C E* \* v 20 -89; Wakefield's sheet *E News* Mar 1, Harris cor. \* 22-90

**Piles**, SCREW piles, in Germany *E News* \* May 26; for bridge piers, Spring \* Aug 4, cyl. pier sinking \* Sep 8-92

**Pill-picker machine** *The Eng* \* May 24-89

**Pilot** chart of No. Atlantic ocean, Hayden, map *F Inst* \* Apr \* June -88

**Pinchin**, Robert *Inst C E* v 95 -89

**Pins**, fibre stain in, J. B. Johnson *E News* \* Jan 28, Du Bois, cor. Mar 10; strains in, Fowler, cor. \* 24; and eye-bar proportions, Stowell. 31-88

**Pipe-joints**, steel, for spiral weld *E News* \* May 31; lead, calking, Aug 30; Holmes' flexible \* Nov 22-90; the Fenney cutting machine \* Feb 21-91; cast iron water pipe cement joints, May 5 \* Sep 8-92

**Pipes**, securing brass flanges to copper, Nagle *Am ME* v 9 -88; equation of, table *Cassier's* Nov -91; fittings moulding in U. S., Forbes *Eng* \* July 20-88; water flowage in, Airy \* Jan 4, 11; air vessels on, M'Creath \* July 5-89; Pott's labor-saving fittings *E & Min* \* Mar 7-91

*E News* and pipe flanges dimens., Codman \* Jan 12-89; computations, Cox, diag. \* Dec 22; measurement vel. of air in, Donkin, 22 *Inst C E*; hot water, india rubber, durability, Belleroche, abs. v 110 -92 *Rev Mines* v 18 -92; cast iron, indus. in U. S. *E Rec* Mar 26; steel, specs. Dec 24-92; wrt. iron and boiler tubes, dimens., table, Morris, Tasker & Co. *Locom* Jan-89. See also GAS — SEWER — WATER pipes, etc.

**Pittsburg**, stats., Ricketson *Am Min* v 19 -91; *Eng* Oct 24 -90

**Pivot** bearing (footstep), friction, expts., report *Eng* Mar 27 \* Apr 17-91

**Planimeter**, polar, novel applic., Emery, inset *Am C E* \* v 18-88; polar, Gieseler *Sc Am Sup* \* Mar 17; spherical, H. Shaw \* Nov 3-88

**Planing** machines, plate edge, Forth bridge works *Eng* \* Dec 14 -88; Sellers', Paris exhib. \* Mar 14-90; double-acting tool rest *The Eng* Nov 9-88

**Plante**, Gaston, pors. *El Wld* \* June 22 *E & Min* \* 29 *Sc Am Sup* \* July 13-89

**Plants** evolution, Coulter *Sc Am Sup* \* June 16-88

**Plaster** of Paris manuf. and use *Sc Am Sup* Mar 21-91 *Chem Tr J*

- Platinum**, electro-dep., Wahl *El Eng* July 16 *El Rev Lond* July 11 *El Wld* June 28 *F Inst* July, (full) *Sc Am Sup* Nov 22 *E & Min* June 21-**90**; metals (full) June 29-**89**; n Nov 29-**90**, Jan 3-**91**; *E News* Dec 20-**90**; and gold indus. of the Ural, Laurent, abs. *Inst C E* v 105 -**91** *An Mines* v 18-**90**; *Sc Am Sup* Nov 23-**89**; prep. and es. of pure, Mylins, Oct 29-**92**
- Playing** cards manuf., Chilon (full) *Sc Am Sup* June 29-**89**
- Plumbing** *E Rec* \* Feb 4, 18 \* June 9, 16; N. J. law, July 7 \* 14, N. Y. specs. 21, Toronto, 28; Sep 1, 29, Nov 24-**88**; Boston Custom-house, May, June; Chic. regulations, Oct 26; N. Y. Cty. Court-house \* Dec 21-**89**; Turn Verein building, N. Y. \* Feb 8, 15; and drainage specs., N. Y. city, Apr 19, 26, May 3, 10; Boston law, June 21-**90**; St. Louis, Mo. inspection, Apr 4; Madison Sq. Garden, N. Y. \* 11; Birm., Ala., practice (rules) \* June 13; in 72d st. houses, N. Y. \* Nov 14-**91**; Chic. ordinance, Feb 13; Fifth Ave. theatre, N. Y. \* July-Sep; Suffolk Cty. Court-house \* Sep, Oct -**92**
- Pneumatic**, hoisting, Wheeler *Am Min* \* v 19 -**91**; dispatch, Wildemann system *Eng* \* Nov 13-**91**; tool, MacCoy's, com. report *F Inst* July -**89**; pumping ap. *Iron Age* \* Dec 8; dispatch improvements *Sc Am Sup* \* Feb 27-**92** *Eng*; tubes, Postal telegraph system, Great Brit. *The Eng* \* Dec 18-**91**
- Pneumonia**, M. Smith *Sc Am Sup* Dec 1-**88**
- Pole** road locomotives *E News* Mar 2-**89**
- Police** signalling, Morgan's aut. elec. system, Hill *El Rev Lond* \* Mar 7-**90**
- Pollard**, Thomas S. *Inst C E* v 99 -**90**
- Polygons**, regular, graph. construct., Weihe *Lehigh Eng J* Feb -**89**
- Pompeiiian** house of Pansa, restoration *Sc Am Sup* \* Nov 8 -**90**
- Population**, the world's, n *Eng* p 458, Oct 16-**91**; finding the center of, n *E News* June 15-**89**. See also under names of countries, cities and places
- Porcelain**, manuf. in France *Eng* \* Jan 17, 24 \* Feb 7, 21 *Sc Am Sup* \* Mar 22, 29-**90**; English china, Bayley, abs. Apr 7; manuf. possibilities, Elbers *E & Min* Feb 25-**88**
- Portable** engines and boilers. See **BOILERS — ENGINES**, portable
- Porter**, John A. por. *E & Min* \* Sep 26-**91**
- Post**, penny. jubilee. ed. *Eng* May 23-**90**

**Postal** telegraph, Great Brit. (full) *The Eng* \* Dec 18-91

**Posts**, yellow pine, new formula for, proposed, Stanwood *Tech Q*  
Apr -92. See also COLUMNS

**Posture** and its indications, Lander-Brunton *Sc Am Sup* \* Aug  
13-92

**Potash**, report, Payne *F Inst* Dec -92; yellow prussiate *Sc Am  
Sup* Aug 11-88. See also CHEMISTRY, potash

**Potter**, William A. *Inst C E* v 91 -88

**Potts** Arthur *Inst C E* v 96 -89

**Potts**, Frederick A., por. n *E & Min* \* Nov 17-88

**Powder**. See EXPLOSIVES, cake — gun powder

**Powell**, John W., por. *E & Min* Jan 30-92

**Power**, measurement of, Gray *Am M E* \* v 13 -92; hot air and  
steam for *Cassier's* Nov -91; large units, economic limit of  
*Eng* Dec 4-91; supply at Liverpool, Feb 12-92; plants for  
hydr. *E News* Aug 23-90; river Rhone, util. of motive power  
at Geneva, Powles, inset *Inst C E* \* v 96 -89. See also  
DYNAMOS: ELEC. motors — power transmiss; HYDRAULIC;  
NIAGARA Falls util; POWER transmission: RAILROADS, elec.  
power stations

**Power** meter *El Rev Lond* \* July 22-92; and indic., Waite *El  
Wld* \* Mar 15-90

**Power** transmission. Hering *Cassier's* Apr; rope drive for, Grim-  
shaw \* July; variable speed, Spaulding *El Rev* \* Dec 24-92;  
by water and air, Donaldson *Eng* Mar 16, Hanssen, cor. Apr  
27, May 11, 18-88; pneu. distrib., Lupton, Sep 12-90; elec  
Feb 20, 27, Kapp, Mar 6, and hydr., Blaine, May 22, June 5  
Shaw's transmitter \* Dec 25-91

*E News* util. of Niagara n Nov 29-90; Hering, Mar 19  
*Power* Apr -92; elec., Sprague *F Inst* \* Mar \* Apr -89; to  
great distances by compressed air, Unwin *Inst C E* \* v 93  
-88; rope *Sc Am Sup* \* Mar 24-88; by manila ropes, Gregg \*  
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also BELTING; COMPRESSED air; DYNAMOS; ELEC. motors —  
power transmiss; HYDRAULIC; RAILROADS, elec. power sta-  
tions; ROPE driving; WIRE rope

**Precious** stones, produc. '91, Kunz *E & Min* Jan 2-92; Kunz  
*F Inst* Sep, Oct -90; and diamond cutting, do. *Sc Am Sup*  
July 11-91; in last decade, do. (full) *Soc Arts Mass* -88

**Preservative**, for meat, Terne *Sc Am Sup* Feb 6-92 *F Inst*

- Presses**, power press problems, O. Smith *Am M E* v 9 -88; foot press, n *Eng* \* Mar 13-91; drop, foundations for, Gorham Mfg. Co., Prov., R. I. *E News* \* Feb 22-90. See also FORGING — PACKING — PRINTING presses
- Pressure** gauges, for high pressure gases, Budenberg *Eng* \* Jan 29 -92; open mercury column for high pressures, Bird *E News* \* July 19-90; mercurial, on Eiffel tower *E Rec* May 23-91
- Prices**, regulation, legal theories of, Hadley *R Gaz* Aug 12-92. See also FOOD; LABOR and names of articles
- Priestley**, Joseph, por. (full) *Sc Am Sup* \* May 4-89
- Prime**, Charles *Inst C E* v 102 -90
- Prime** movers, use of spirit in, Yarrow *The Eng* \* May 31, ed. June 21; the Cardium (nature of), Gamgee \* Oct 18, Nov 1-89. See also ENGINES; HOT air engines; LOCOMOTIVES; TIDE motors; WINDMILLS
- Printing**, or relief plates making, Joyce proc., Hoke or Star proc. and Hanson proc. *Sc Am Sup* Oct 19-89
- Printing** machine, the electro-matrix *E News* Apr 13-89. See also TYPE-setting machines
- Prison** reform, Canonico *Sc Am Sup* Sep 3-92; Wayland *Soc Arts Mass* -89
- Prjevalsky**, N. M. (explorer-Asia) (full) *Sc Am Sup* Feb 23-89
- Professions**, the, shall they be regulated, Shaler *E Mag* Oct -92
- Professors**, private practice by, ed. *Eng* Oct 23-91
- Progress**, vibratory law of, Hovey *Sc Am Sup* Dec 22-88
- Projectiles**, elec. welded, Maxim *Cassier's* \* Oct -92; vel. of, Holden *Eng* Oct 23-91; Justin projectile, expts. *E News* \* Aug 4-92; path of, Gilman *F Inst* Oct, Ingalls, cor. Nov -91; forged steel, manuf., Carnegie, abs. *Inst C E* v 110 -92; Krupp's and plates expts. at Meppen *Sc Am Sup* \* Sep 8-88, do. and Brit. steel-faced plates *The Eng* July 13-88. See also GUNNERY and armor
- Propeller**, the jet *Sc Am Sup* Nov 15-90. See also SCREW propellers
- Providence**, R. I., Brown University *Eng* \* Sep 11-91
- Psychical** research, Savage *Arena* Nov, (how we feel when we die) *Rev of Revs* Sep; Psychology, internat. Congress *Sc Am Sup* Dec 24-92
- Public** works, National, cor. *F Inst* Sep -88
- Pulley** block Weston's triplex spur gear, Yale & Towne Co. *Eng* \* Aug 22 *E News* \* July 26-90

**Pulleys**, cone and step, method of finding diams., C. A. Smith *Am M E* \* v 10 -89; wood (various) *Pwr* \* Mar: size and speed \* Oct -92. See also BELTING

**Pullman**, Ill. *Eng* Oct 31-90

**Pulsometer**, test of a, De V. Wood *Am M E* v 13 -92 *E Rec* Nov 21 *The Eng* Dec 25 *E News* Nov 21; Mashin's aut. steam vac. \* Apr 4-91; De V. Wood *Sc Am Sup* June 29, improvements \* Sep 14-89. See also PUMPS

**Pulverizers**, Buchanan's Granulator *E & Min* \* Jan 17-91; Am Ball \* Sep 24-92; the Ball mill *The Eng* \* Sep 26-90.

See also DISINTEGRATORS; GRINDING; MILL, the Sturtevant

**Pumping** engines, Cornish or double beat pump valves, Nagle *Am M E* \* v 10 -89; new type, Laval *Cassier's* \* Sep -92; trip-expan., Mildura Irrig. Co., inset *Eng* \* Jan 18; machinery, Paris exhib., Hanarte system \* July 26-89

*E News* proposals, table, Feb 4-88; compound, power of, tables, Hill, Apr 27-89; machinery in the Fenland and by the Trentside, Gibbs, inset *Inst C E* \* v 94; underground, Bernissart coll., Ledent, abs. v 94 -88, do. high-lift, Vanhassel, etc., abs. v 107 -92 *Rev Mines* v 2 -88, v 15 -91; machinery, ancient and mod., Holloway *Sc Am Sup* June 29-89; compound differential, Bradley, inset *The Eng* \* July 23-91

BOSTON, high-duty, relative econ., ed. and cor. inset *E News* \* Dec 22, 22, Leavitt *E Rec* \* June 4-92

BOURNMOUTH water-works, Worthington *The Eng* \* Jan 4-89

BROOKLYN, N. Y., water-works, of 1860, hist., McElroy *Am M E* v 13 -92; 48-in. check valve *E News* \* Oct 24-91; Milburn station, trip-expan., inset \* Mar 12-92

CHICAGO, Ill., West Side station, test of Indiana block coal, Nagle *Am M E* v 13 -92; tests *E News* Jan 31; trip-expan., inset \* May 31-90

CORNISH, 'Davey' *Cassier's* \* Dec -91

CROYDEN water-works, compound, inset *The Eng* \* Aug 29-90

DAVEY's differential, n *The Eng* Jan 13-88

EATON water-works *The Eng* \* Dec 30-92

ELECTRIC machinery, Wheeler *Cassier's* \* Nov -91; in mines *E & Min* \* June 15-89, coal mines *R & Eng* Mar -88

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- Railroads**, CONTINUOUS, Silsbee's multiple dispatch, Schmidt *Eng* \* Jan 9-91. See also R's, sidewalk
- CORPUS Christi & So. Am. *E & Min* Sep 20-90
- COSTA Rica, n *E News* \* Feb 16-89
- COUPLERS, U. S. R's equipped with M. C. B. aut., inset map *E News* \* Apr 25, 25-91. See also CARS, couplers
- CROSSINGS, of great rivers, location, Zdziarski *R & Eng* \* Aug - Nov -92; grade. abolition in Mass., ed. June 27. Mass. law, July 25-90
- BUFFALO grade, prob., Guthrie *R Gaz* \* May 6-92
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- COMPLICATED, Minn. & St. Louis *E News* \* Dec 28-89; N. Y., Prov. & B. \* Apr 26; Penn. R. \* Mar 15-90; Chic., Stewart ave. *R Gaz* \* Apr 24-91 \* Jan 29-92
- FONTAINE continuous *R Gaz* \* June 19, (details) \* Dec 18 -91
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- MASS. R. Commiss. report, ed. *E News* Feb 23-89
- MOVABLE point, Wharton R. Switch Co. *E News* \* Dec 14 -89
- WOODLAWN, N. Y., N. Haven & H. *E News* \* Jan 24-91
- WORCESTER, Mass. grade, prob. at *E Rec* Apr 30-92
- CUBAN, operating expenses *E News* June 23-88
- CULVERTS, standard box and road beds. Kan. C. & Om. *E News* \* Mar 3; pipe, 31-88; wooden box and cattle-guards. Or. Pac. standard \* Jan 12. pile and box drains \* 19; plans, Can. Pac. \* Apr 6; arch, I. D. & S. \* June 8; and cattle-guards, Can. Pac. \* Aug 24, B. & M. \* 31-89; R. maintenance requirements, Swift \* May 30 \* June 6, 13, 27-91; Jameson *R & Eng* \* Apr -89; Ind., Decatur & Springfield, Hill *R Gaz* \* May 25-88; pipe, 'Plant' system, Howe \* Apr 24-91
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- FENDERS, West End, Boston, report *E News* Feb 21-**91** \* Oct 27-**92**
- FLORENCE & Fiesole, Sherbner (full) *El Rev Lond* \* Sep 25, inset *Inst C E* \* v 106 -**91**
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- GEARING, epicyclic, for cars and elevators, Aldrich *El Eng* \* June 22-**92**; wooden-toothed *El Wld* \* Aug 2-**90**. See also R's., elec., cars — motors
- GREAT Britain, tramways position in England *El Rev* Aug 8 *E News* July 18-**91**; United Kingdom, table *El Wld* Jan 25-**90**; and cable, McCallum *St R J* Oct -**92**
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SPRAGUE system *El Eng* \* Sep -**89**; vs. T. H. system, Hutchinson *El Wld* Nov 1-**90**; Boston *St R J* \* Jan -**89**

SOUTH Staffordshire tramways *El Rev Lond* \* Nov 18 *The Eng* \* 18-**92**

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*St R J* \* Sep -**90**

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- JERSEY City terminals, Penn. R., inset *E News* \* Sep 26-**91**
- KNOXVILLE So. Tenn., piece of difficult location *E News* \* May 9-**91**
- LA Guaira & Caracas, Heinké, abs. *Inst C E* v 110 -**92**
- LAKE Erie. See RAILROADS, N. Y., Lake Erie
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- LANARKSHIRE & Ayrshire *Eng* Sep 7-**88**, Tait *Inst C E* \* v 105 -**91**
- LANCASHIRE & Yorkshire, England, notes *E News* \* Mar 28-**91**
- LARTIGUE single line, in Kerry, n *Sc Am Sup* \* Apr 7-**88**
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- LOCATION, with taper curves, Olmstead *E News* \* July 21, 28-**88**; general, with references to sources of traffic, Wellington, Aug 24, Oct 12, 26, Nov 2, field-work calcs. Nov 9, 16, 30, Dec 7, 28-**89** \* Jan 4, 25, Feb 8; frog, Avery \* Mar 22-**90**; curved vs. tangent, Norfolk & West. \* Oct 5-**89**
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- LONDON, growth, ed. *Eng* June 1-**88**; City & So. Lond. deep tunnel, ed. \* Nov 7, 7 \* Dec 26-**90**; Central R. bill, Mar 6, 13-**91**; R's terminating in, ed. *E News* Sep 29-**88**; Met., notes \* May 2-**91**; traffic, Kemmann, bk. review *R Gaz* Nov 4; Waterloo terminus enlargement, Lond. & So. W. *The Eng* \* May 20-**92**. See also R's, underground, Lond.
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- AUSTRIAN, combined adhesion and rack rail *E News* Feb 2 -**89**
- BRIENZ & Rothhorn rack, Preller, inset *Eng* \* Nov 11, 18 *E News* \* Dec 15-**92**
- BRUNIG, Switz. *E News* Dec 15-**88**
- BURGENSTOCK wire-rope, Lucerne lake, Switz., Sommerguth, abs. *Inst C E* v 100 -**90** *Zeit deut Ing* -**90**; cable *R & Eng* Aug -**90**; first elec., n *The Eng* Sep 7-**88**
- DUNDERBERG gravity, Hudson Highlands, map *E News* \* Dec 21-**89**
- FLORENCE & Fiesole elec., Sherbner, inset *Inst C E* \* v 106 -**91**
- GENEROSO, Lake Lugano, Switz., abs. *Inst C E* v 107 -**92**
- GUTCH, Lucerne, Switz., n *R & Eng* \* Sep -**92**
- HARTZ, cost of working, R. Wilson *Inst C E* \* v 96 -**89** *The Eng* Mar 22-**89**
- HOELLENTAL rack, Baden *Eng* \* Jan 30, insets \* Feb 6, 27 \* Mar 13-**91**
- HONG Kong & Victoria Gap tramway *The Eng* \* Jan 23, 30, 30-**91**
- JUNGFRAU, Switz., projected, King *Eng* \* July 4, pneu. *E News* Mar 29 \* July 19 *R Gaz* July 18 -**90**
- LAUTERBRUNNEN-Murren hydr. lift and elec. *The Eng* Oct 7 -**92**
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- MANITOU & Pike's Peak *Eng* \* Sep 4, Hastings, abs. *Inst C E* v 104 -**91** *Sci Am* Jan 24-**91**; *E News* Dec 7-**89**; Abt rack rail system \* Apr 19 \* Oct 4; *R Gaz* \* Apr 4-**90**
- MATTERHORN, proposed *R Gaz* \* Sep 4-**91**
- MONTREUX, Switz. steep wire-rope, Territet-Glion, Strub, abs. *Inst C E* v 96 -**89**
- NEVERSINK mt., test, Hering, Aldrich (very full) *El Wild* \* May 28-July 30-**92**

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- TRAIN lighting, elec. *E News* Apr 7-**88**, Seldon, Nov 2-**89**; Timmis' system *The Eng* Apr 13-**88**. See also CARS, lighting

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*R Gaz* No. E. R., England, ed. \* Mar 28; air resist. at very high vels., Chanute cor. Dec 26-**90**; locom. cyl. power consumed ahead of first car \* June 17-**92**; Slack *Steven's Indic* July 15-**88**; *The Eng* Apr 6, Sep 21, 21-**88**, ed. Mar 14-**90**. See also AIR; ATMOSPHERIC resist.

**TRAINS**, vibrations instruments, Milne *Eng* Oct 11-**89**; colliding, destructive force of, cor. *E News* Aug 4, 25, Adams, Sep 8 **88**; length increase on Austrian R's \* Mar 22-**90**; sanitary *Sc Am Sup* \* Jan 21-**88**; articulated rolling stock, Paris, Sceaux & Limones R. *The Eng* \* Nov 21-**90**; speeds, see R's speeds; stop, see R's stop

**TRANSANDINE**, Argent. Repub. & Chili *Eng* \* Sep 19-**90**, tunneling plant, inset \* Apr 24 \* May 22-**91**; map *E News* \* Oct 25-**90** \* Feb 13-**92**; Child *Harper's M, R & Eng* Dec -**90**, n Jan -**92**, *R Gaz* \* Oct 17-**90**, *Sc Am Sup* \* June 20 -**91**

**TRANS-Caspian**, Rymkienicz, map *E News* \* Sep 29-**88**; and territory, Heyfelder, abs. *Inst C E* v 92, Strukel, abs. v 94 -**88**; *R Gaz* Jan 3-**90**; *Sc Am Sup* \* Feb 11-**88**

**TRANS-Caucasian** *E News* Feb 11-**88**

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**TRANS-Siberian**, ed. *Eng* Aug 12 *Sc Am Sup* \* Jan 30-**92**, map *The Eng* \* Dec 4-**91**; world, map *R & Eng* Nov -**90**. See also R's, Siberian

**TRESTLES**. See TRESTLES

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**TURKEY**, Asiatic, construct. *E News* \* Dec 15-**92**

**TURNOUTS**. See R's, sidings - switches

**Railroads, TURNTABLES**, Silverton R., Col., Gibbs, discuss. *Am CE* \* v 23 -90; and traverser, St. Lazare station, Paris *Eng* July 19; Paris & Or. R., Paris exhib. \* Nov 15-89; wrt. iron deck *E News* Dec 21-89; wrt. iron \* Jan 4-90; Jameson *R & Eng* \* Oct -89; 60-ft., for 100-ton locom. *R Gaz* \* Feb 28-90; standard, Passaic Rolling Mills Co. \* Feb 5; for Howe truss draw-br., Fraser river, Can. Pac., Cambie \* Nov 25 -92

ULEABORG, Finland, Strukel, abs. *Inst CE* v 92 -88

UNDERGROUND. See also Rap. Tran. Commiss. report to Mass. Legislature, Apr 5-92; TUNNELING, Great Head system; TUNNELS

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BLANC system of subway structure for city sts. *El Wld* \* Mar 22-90

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PARIS elec., n *El Rev* \* Jan 30-92; Met. R. subway construct. *E News* \* Dec 13-90, n *Sc Am Sup* \* Jan 3-91 *Genie Civil*

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*E News* Southern states, col. inset map, ed. \* Feb 2, 2; construct., states east of Chic., prog., col. inset map, ed. \* Mar 30, 30, Apr 6; growth, col. inset diag., ed. \* 27; No. West., col. inset map, ed. \* May 11, 18; minor No. West. systems, ed. June 1; Southern, col. inset map \* 15, 15, ed. 22; So. West., col. inset map, ed. \* July 20, 20; construct. 27; No. West., col. inset map, ed. \* Aug 3, 3; in '88, Poor's Man. bk. review, ed. 17, 17, state commissions' reports, ed. 24, 24; far West., col. inset map, ed. \* Sep 7 \* Nov 30; So. West. col. inset map, ed. \* Sep 28, 28; Rocky mts. and Pac. states, ed. Nov 30; construct. of four years, col. inset map \* Dec 28, 28-**89**

*E News* smallest Am., Monson, Me. Feb 22; construct. in '90, col. inset map \* Mar 1, 1; construct., states east of Chic., col. inset map, ed. \* Apr 12, 12; Southern, col. inset map, ed. \* June 14, 14; No. West. construct., inset map \* Aug 2, 2; in '89, Poor's Man. bk. notice, 2; No. Minn. construct. Sep 13; So. West. construct., inset map, ed. \* 27, 27; Rocky mts. and Pac. states, ed. \* Nov 29, 29; construct. of '90, ed. Dec 27-**90**

*E News* in '90 and for five years, inset map, ed. \* Jan 3, 3, Aug 8; in '91, inset map \* Feb 28; states east of Chic., inset map \* Apr 11; in South, stats., inset map, ed. \* June 13, 13; and English, ed. July 4; No. West. construct., inset map \* Aug 1, 1; So. West. do., ed. \* Oct 3, 3; far West., inset map \* Nov 28-**91**

*E News* mileage laid in '91, inset map \* Jan 23; construct. of '91, inset map \* Mar 5, 5; states east of Chic., inset map \* Apr

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9; Southern, inset map \* June 23; prog. '91, Poor's Man. review, July 28, 28; No. West., inset map \* Aug 4; So. West. prog., inset map \* Oct 13; far West. construct., inset map, stats. \* Dec 8, 8-**92**

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*R Gaz* new construct. '88, tables, June 1, 8; mileage, ratio of pop. to, White cor., diag. \* Oct 5; Interstate Com. 2d report abs. Dec 7-**88**, stats. do., ed. Jan 18; construct. in '89, table, ed. Apr 19, 19; in '88, Poor's Man. review, ed. Aug 16-**89**; net earnings '89 (and prices) Feb 28; construct. Jan - July 4, in '90, 18, in '89, Poor's Man. review, ed. Aug 1, 1-**90**

*R Gaz* construct. Jan -**90** - Jan -**91**, table, ed. Jan 2, Jan - July -**91**, ed. June 26, 26; in '90, stats., Poor's Man. review, ed. Aug 7, 7; stats., census, ed. Nov 6; traffic and earnings, ten years' growth, ed. 13-**91**; construct. in '91, table, Jan 1, Poor's Man. review, ed. July 29, 29, Gov't. stats. and world's, Dec 16, 16-**92**; ten years' growth, ed. *The Eng* Nov 13-**91**; in '91, Oct 28-**92**. See also R's, Interstate Commerce Commission reports VICTORIA, New So. Wales *Eng* Nov 14, 28-**90**, Jan 30 \* Mar 6 Apr 10-**91**

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WHEELING Union Bridge *R Gaz* \* July 11-**90**

WRECKS, outfits for handling, Hynes *R Gaz* \* Dec 5, 19-**90** \* Jan 9, 23, Feb 13, 27, Apr 17-**91**

YARDS, Columbus, O., Penn. R. *R Gaz* \* Mar 25, 25-**92**. See also R's, stations

YUCATAN, E. Thompson report *E News* Dec 15-**88**

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R. Hunt \* v 17 -**89** *E & Min* \* Oct 27, Nov 3 *E News* \* Dec 1 -**88**; wear of as related to their section, Dudley *Am Min* \* v 18 -**90**

*Eng* use of heavier, Sandberg, Feb 8-**89**, steel. do. Aug 1, 1 \* 8; rail profile tracing ap., Schilling \* Sep 19 *R Gaz* \* Oct 10-**90**; devel. Am. rail. and track, Watkins *Eng* \* July 1, 22 \* Aug 12 \* Sep 23 \* Oct 14, 21-**92**

*E News* wear of, in India, ed. Jan 21; fastening and track Inter-St. Rap. Tran. Co. \* Apr 28; manuf. cost at Edgar Thomson steel works '87. Scott, n June 9; a practical system of tests, ed. July 21; the Dill nut lock \* Sep 1; and wheels, relations, report \* Nov 3-24-**88**

*E News* German stats. Jan 12; manuf. cost in Penn. and England, comparative, Schoenhof, Consular report. Feb 9; portable saws \* Feb 23; hardness of inside and outside, compar. tests and ed. \* Apr 13, 13; and wheels, relations. Am. C. E. com. report \* June 22; consumption, Tratman, July 20; fastenings. Penn. R. \* May 11, Venezuelan R's \* Aug 3, Cox tie-plate \* Nov 23; conditions in manuf. which influence life of, Sep 21; and tires wear, N. E. R. Club pro. \* Oct 19-**89**

*E News* Cito & Funck's lifting device \* July 12; steel. chem. and mechan. considered, Sandberg, Aug 23, discuss., insets (full) *Inst M E* \* July *R Gaz* Aug 15, 29 *The Eng* Aug 1, 8; foreign practice and tests *R Gaz* Aug 23; wear of different grades, Post, Neth. R's Apr 26, in Swiss tunnels, n Oct 11-**90**

*E News* 100-lb steel, Penn. R. \* July 21; rail and chair, Lond. & No. W. \* Sep 1; continuous (1100 ft.), expansion, Moxham, ed. \* Oct 27, 27-**92**; use of heavier, Sandberg, inset, abs. *Inst C E* \* v 95 -**89**; rusting in tunnels, Thorner, abs. v 99 -**90**; wear of steel. Busschere (full) *R & Eng* \* Nov -**89**; 80-lb. standard, Lehigh Val. \* Jan -**91**

*R Gaz* steel, manuf. and life, Delano, Aug 10; specs. for manuf., R. Hunt \* Oct 26; 80-lb., Mich. Cen. standard \* Dec 7 -**88**; specs., tests and inspection, cir. replies \* Jan 18, 25 \* Feb 15; heavy, Sandberg, 15; rail flangers, N. W. R. Club \* 15; breakages and splices, cor. Mar 8; form of rails and wheels, reports \* May 17, June 28; Goliath rail, Sandberg \* July 26, base plate, do. \* Sep 20; elec. welding of, Ries, Sep 27, cor. *St R J* Oct; steel, rolling, Nicholson *R Gaz* \* Nov 22; the Ham-bay clip and detector bar \* Dec 20-**89**

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FROG, spring, Penn. Steel Co., '88 *E News* \* Dec 15-**88**; the Monarch spring \* Apr 25-**91**. See also Rs, frogs – switches

JOINTS, splice-bars and specs. for manuf., R. Hunt *Am Min* v 18 -**90**; Sandberg's *Eng* \* July 26-**89**; N. Y. Cen. *E News* \* Apr 21; Dill nut lock \* Sep 1; Foster bridge, Oct 6; Den. & Rio Gr. standard \* 13; Fisher br. imps. \* 27-**88**; adjust. panel, Pough. br. \* Feb 23; the Thomson \* June 1; rail joint question, ed. \* Dec 28-**89**

*E News* N. Y., L. Erie standard \* Sep 27; Weber joint tests, Roadmaster's Assoc. \* Dec 20-**90**; the Patterson \* Feb 21; B. & O. standard and 85-lb rail \* July 18; the Heath \* Sep 19; rail and splice-bars, N. Y., N. Haven standard \* Oct 3-**91**; splice-bar, Fall Brook Coal Co. \* Mar 5; Indian State R's \* Dec 29-**92**; fish plates tests at freezing temp., Buel *E Rec* July 4-**91**; Soule's *R & Eng* \* Oct -**89**; Connell's, Church-hill's pats. \* Mar -**91**

*R Gaz* 3-tie, with Bush's interlocking bolts, N. Y. Cen. \* Mar 30; Penn. R. \* Apr 6; L. Shore & Mich. So. 48-in. standard \* Nov 30-**88**; 3-tie angle splice, bush bolt, N. Y. Cen. Apr 12; 70-lb, Sav., Fla. & W. \* May 17; Goliath, Sandberg \* July 26-**89**

*R Gaz* and chair, Lond., Br. & So. C. \* Feb 7; splice-bars specs., R. Hunt, Aug 15; recent \* Sep 26; the Clark-Fisher \* Oct 17-**90**; track joints, table, Ellis, Aug 28-**91**; French, Mussy \* Apr 1; Scaife, Oct 14; the Price \* 14-**92**

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*E News* various designs, Hawks, ed. Mar 9, 9; and wheels, forms of \* May 11, proper relations of wheels to, report, July

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6; standard, ed. Aug 3-**89**; flat top, suggested, Churchward, n  
\* Nov 22-**90**; form of, Gunn cor. \* May 23-**91**

*R Gaz* and wheel relations of, com. report, ed. \* Nov 2; balanced, Dec 7-**88** \* Apr 12-**89**; standard, ed. May 30; \* June 27-**90**. See also under RAILS

BERLIN R., new rails *E News* \* July 26-**90**

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CHICAGO, Mil. & St. P. *E News* \* Mar 30, 30-**89**

CHICAGO & No. W. and expt. wheel tread, C., M. & St. P. *E News* \* Mar 30, 30-**89**

FALL Brook Coal Co. *E News* \* Mar 5-**92**

FRANCE, Northern R. *R Gaz* \* Feb 22-**89**

GOLIATH and steel base plate, Sandberg's *E News* \* Nov 9-**89**

GREAT Northern, U. S. *E News* \* Feb 13-**92**

KENTUCKY Union R. *E News* \* Mar 16-**89**

NEW York Cen. 100-lb. *E News* \* Mar 19; standard \* Apr 2-**92**

NEW York, L. Erie & West. *E News* \* Feb 1-**90**

QUEBEC Cen. 60-lb. standard *E News* \* Mar 19-**92**

SANDBERG'S permanent way *Eng* July 26 *E News* \* Nov 9-**89**

SAVANNAH, Fla. & W. 70-lb. *R Gaz* \* May 17-**89**

SOUTH Australia Gov't. standard *E News* \* Oct 31-**91**

UNION Pacific *R Gaz* \* Feb 1-**89**

VIGNOLES, the first *E News* \* Nov -**89**

**Rainfall**, and discharge of sewers, Kinchling, insets (very full) *Am C E* \* v 20, max. rates of, Fitz Gerald, insets \* v 21 -**89**; cause of rain and structure of atmos., Velschow \* v 23 -**90**; flow of streams and storage, Fitz Gerald, discuss., map (full) \* v 27 -**92**; facts about rain making, Curtis *E Mag* July -**92**

*E News* in western arid regions, Greely report, Mar 16, 23-**89**; max. rates \* July 21; flow of streams and storage, diags. \* Oct 20; obs., Phila. *E Rec* Nov 5-**92**; artif. rain making, Houston *F Inst* Oct *Sc Am Sup* Oct 17-**91**; mean or av. and fluctuations, Binnie, discuss. (full) *Inst C E* \* v 109 -**92**; rain formation, Blanford *Sc Am Sup* May 11, 18; and storms, Hazen, June 15-**89**; universal suction, Durozoi \* Nov 7-**91** *Genie Civil*; of the Globe, Tripp *The Eng* Mar 18-**92**

**Rain** gauges, self-registering, Hering *E Rec* \* Jan 3 \* Mar 14-**91**

**Ramie** plant, source of textile fibre *E News* Oct 5; Juvenet *F Inst* Nov *Sc Am Sup* Nov 23; fibre cleaning machinery \* May 25-**89**

**Rams** and hammers. Jameson *R & Eng* Oct -**89**. See also HYDR. rams; STEAM hammers

**Rapid** transit, Rap. Tran. Commiss. report to Mass. Legislature, Apr 5, '92, abs. *St R J* May -**92**; elec. interurban commun., Zipernowsky *El Rev Lond* Sep 18, 25, Oct 2-**91**; and elec. work on N. Y. eleva. R., Daft (full) *El Wld* July 6 *El Rev* \* 6-**89**; N. Y., Sprague, Mar 7, Lond., Sterne, discuss. \* 21; system, Sprague, June 6-**91**, N. Y., solution do. (full) *El Wld* sup. Feb 21, Mar 7, (full) May 30-**91**; in great cities, Day, Jan 2-**92**; prob., Gribble (full) *E Mag* \* May \* June; in N. Y. July -**91**; lessons in, Heilprin, July -**92**; N. Y. city *E & Min* \* Mar 23-**89**, Rap. Tran. Com. report \* Oct 24-**91**

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*E News* Reno system \* Apr 2; underground, plans, Broadway franchise sale, specs., inset, ed. \* Nov 24, 24, inset \* Dec 1-**92**; N. Y. prob., Steinway Commiss. report *E Rec* Oct 10, munic. ownership argus., Prout, Nov 21, Croes, 28-**91**; in cities, Haupt *F Inst* \* Jan -**88**; Wright *Pop Sci* Apr -**92**; N. Y. *R & Eng* Nov -**91**

*R Gaz* N. Y., T. Cooper, Mar 20, Gribble, Apr 3, W. H. White \* 24; reports, ed. (full) Oct 9 \* 16, 23, 23, Nov 20-**91**; speed, Cowper, July 29-**92**; Thompson's gravity system *Sci Am* Sep 8-**88**; Chic., Stoltenberg *Sc Am Sup* \* May 25-**89**; in cities, T. C. Clarke *Scribner's* \* June -**92**; Haupt *St R J* Feb -**88**; Sprague, sup. \* Mar, June, question, Gribble \* Mar, May, Crosby \* Apr: Lond., Reckenzaun, May, Aug \* Dec -**91**. See also names of places; R's, elec. — elevated — underground, etc.

**Ravine** du Sud, Is. of Hayti, Crowell, discuss., insets *Am C E* \* v 24 -**91**

**Rawlinson**, Robert *The Eng* Jan 6-**88**

**Raymond**, Robert R., por (full) *E & Min* \* Dec 29-**88**

**Real** estate, Internat. Co. of Mex. & Lower Cal., n *E News* Mar 31-**88**. See also **LAND**

**Reed**, Edward M. *Am C E* v 26 -**92** *Am M E* v 13 -**92**

**Reed**, Samuel B. *Am C E* v 27 -**92**

**Refractory** materials, Egleston *Sc Am Sup* Sep 27, Oct 4-**90**.  
See also **BRICK**, fire-brick

**Refrigerating**, aut.system, Denver, Col., Hanks, insets *Am C E* \* v 24 -**91**; 35-ton machine, ammonia-absorption type, performance, Denton *Am M E* \* v 10-**89**, 75-ton do. \* v 12 -**91** *E & Min* \* May 16, 23-**91**; plant test, De V. Wood *Am M E* \* v 11 -**90** *E News* \* June 28-**90**; results of performance of, Denton-Jacobus, July 7 *Am M E* \* v 13 -**92**

*Cassier's* mechan. refrigeration, Penney, \* Dec -**91**; La Vergne Co. \* Apr -**92**; Bate Co. decis. *El H'd* Feb 2-**89**; de la Vergne system, inset *Eng* \* June 15, 22-**88**; ammonia compression system \* Feb 8-**89**; machines, Richard, bk. review, Jan 9; tests \* July 31 \* Aug 28; and ice-making plant, Newcastle-on-Tyne \* Dec 4-**91**

*E News* Miller's ap. \* Jan 9; use of oil in ammonia gas compressors and effic., Strombeck, insets *F Inst* \* Apr -**92**; use of ammonia as refrig. agent, Lightfoot *Sc Am Sup* May 26 *The Eng* Oct 26-**88**; machines, Peabody *Tech Q* \* May -**89**; machine, Birkenhead *The Eng* Oct 5-**88**; Arktos cold air and freezing ap. \* Mar 8; Pontifex's machine, Sep 27-**89**; Linde system plant, 150-ton, Shadwell works, inset \* May 16, 30-**90**.  
See also **ICE** machines

**Refuse**, disposal, house *Eng* May 15-**91**; Watson (full) Sep 16 \* 30, and ed. *E News* Oct 6, N. Y. city report, 27 \* Dec 1; cremators *E Rec* \* Oct 8-22, Nov 19-**92**. See also **CREMATORIES**; **MUNIC.** eng.

**Reid**, David *Inst C E* v 110 -**92**

**Rendering** tanks construct. *Locom* Feb -**89**

**Rennie**, William C. *Inst C E* v 105 -**91**

**Reproduction**, probs. of, Hartog *Contemp Rev* July -**92**

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BOSTON, Mass., Waban Hill *E Rec* \* Aug 24, 31-**89**

BUFFALO, N. Y., Prospect, new *E News* \* Jan 10-**91**

COSHOCOTON, O. 320,000 gal. covered *E Rec* \* Aug 15-**91**

EALING, Grand Junct. Co. storage *The Eng* Aug 24, 24-**88**

EGYPT, the Raiyan impounding, Nile flood, Whitehouse *Eng* \* Sep 14-**88**, Sep 19-**90**; storage in, ed. Oct 16-**91**

HALLINGTON, West. Henzell, inset *Inst C E* \* v 102 -**90**

HUDSON, Wis. covered *E News* \* Mar 15-**90**

MANCHESTER works, inset *Eng* Feb 5-**92**

NASHVILLE, Tenn., Parsons *E News* \* June 16-**88**

NEBRASKA City, Neb., failure of *E News* \* Apr 19-**90**

NEWTON, Mass. covered *E Rec* \* Apr 18-**91**

NEW York, reservoir 'M,' inset *E News* \* Mar 22-**90**

PARIS, France, Montmartre 3-story covered *E Rec* \* Aug 9, abs. *Inst C E* v 100 -**90** *Sc Am Sup* \* Mar 8 *The Eng* \* Jan 17-**90**; Bechmann, abs. *Inst C E* v 105 -**91** *An Ponts* Feb -**91**

PHILA., Conshohocken hill remark. breaks, Lukins *E News* Aug 18-**88**

TORCY, France *R & Eng* \* Jan -**90**

TORONTO, Ont., Can., Rose hill embank. *E News* \* Aug 2-**90**

WHEELING, Va. *E News* \* Mar 12-**92**

**Resins**, waxes and solid paraffins, Church (full) *Sc Am Sup* \* Apr 9-**92**

**Retaining** walls, for earthwork, Greene *E News* \* Dec 29-**88**; design of, K. Allen *E Rec* \* Nov 12, 19; old revetment wall, Montreal har., Sproule *R & Eng* \* Dec *R Gaz* \* Nov 18-**92**; M'Elroy, Nov 9-**88**. See also DAMS; HARBOR eng; R's, embank; RESERVOIRS

**Retort**, mechan., with continuous feed and discharge, Haig *E & Min* \* Jan 31-**91** *J Soc Chem Ind.* See also GAS retorts

**Reynolds**, Edwin, por. *Cassier's* \* Mar -**92**

**Rhind**, James *Inst C E* v 99 -**90**

**Rice**, culture in cen. China, Franklin *Sc Am Sup* June 8-**89**; hist., Proctor, Oct 10-**91**, manuf., do. July 9-**92**

**Richards**, Thomas M., por. *E & Min* \* Nov 29-90

**Richardson**, Robert *Inst C E* v 107 -92

**Richardson**, William A. *Locom* Apr -89

**Richmond**, Va., eng. prob. at (canal, etc.) Adams *Am M E* \* v 12 -91 *Eng* Jan 9-91

**Riddell**, Robert (full) *Inst C E* v 106 -91

**Rigden**, John L. *Inst C E* v 109 -92

**Ring**, Robert *Inst C E* v 100 -90

**Rings**, thin elastic. flexure of, De V. Wood *Am M E* \* v 12-91

**Riotte**, Eugene N., por. *E & Min* \* May 16-91

**River**-gauging at Vyrnwy reservoir, Parker, inset *Inst C E* \* v 92 -88

**River** motor, fluvialite *Sc Am Sup* \* July 28-88

**River** profile of bottom register ap., Stecher *E News* \* July 25, n *R & Eng* \* Oct -91

**Rivers**, improvement, Atlan. coast, Craighill, *E Rec* \* Aug 11-25, discuss., insets *Am C E* \* v 19 -88, sedimentary discuss., Striedlinger, Worthen, Henshaw, insets \* v 20 -89; mean horse power of, calcs. variable stream and cost of replacing power lost by partial diversion of the flow, Grant, discuss. v 22 -90; self-purification of streams, Rafter, insets \* v 24 -91

*Am M E* river practice of the west (boats), Sweeney \* v 9 88; stream measurements, U. S. Geol. survey results, Newell (full) *Am Min* \* v 20 -92; signalling across, in India, Melhuish *El Rev Lond* Apr 18-90; future world's highway, Gribble *E Mag* \* Apr - June; flood effects in western, Going, Sep -92; mining in Cal., Boynton *E & Min* \* Sep 5-91

*E News* pollution of streams, Hering, Aug 4-88; comput. of discharges, G. Johnson, Sep 6-90; river pollution in U. S., C. Brown, Mar 21, 28, abs. *Inst C E* v 103 -91 *J Assoc E Socs*; self-purification of, Frankland *E News* Sep 5-91; discharge obs. of large streams, Davison *E Rec* May 7; months' imp., Corthell report, Aug 27, Sep 3-92; jetties for imp. estuaries. Haupt *F Inst* Apr -88

*Inst C E* simple method of ascertaining discharge, Harlach, Richter, abs. \* v 91 -88; bars at mouths of tidal estuaries, Wheeler *The Eng* Feb 7, discuss., inset (very full) *Inst C E* \* v 100 -90; self-purification, Stearns, abs. v 105 -91, Meyer, abs. v 109 -92 *Mass State Bd. of Health*; crossings and bridge piers, Otagawa *R & Eng* \* Nov \* Dec -88; nav. river material, expt. researches ap. *Sc Am Sup* \* Sep 24-92

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*The Eng* river flushing, Milwaukee, Dec 28-**88**; imp., applic. of transporting power of water to deepening, Wheeler, Oct 25, Nov 8 **89**, July 18-**90**; and navigable canals, England, Dec 25-**91**; tidal, buoying and lighting, Wheeler \* Apr 8, 29-**92**. See also CANALS, rivers in France, Belgium and Germany

AIRE & Calder nav. and canal waterway, Bartholomew *E News* \* Aug 30-**90**

AVON imp. below Bristol, Chatham, insets *Inst C E* \* v 98 -**89**

BAVARIA, imp. *E News* \* Mar 17-**88**

BILBAO imp. *E News* \* Aug 31-**89**, Churruca report, abs. *Inst C E* v 76, 98, 104, insets, 107 -**92**

BRAZOS, Tex., imp., jetties *E News* \* May 18, June 22-**89**

BRENTA imp., Cesareni, abs. *Inst C E* v 99 -**90**

CLYDE, Millar, Blackie, Lond. '88, bk; export trade '88 *Eng* Jan 4: Macalister, abs. *Inst C E* v 95 -**89**

COLORADO cañons, availabil. for R. purposes, Stanton, discuss., insets (full) *Am C E* \* v 26 -**92**

COLUMBIA, jetty *E News* \* Apr 18-**91**

COSEL, imp. at, Oder river (Europe) *E News* \* May 3-**90**

DANUBE imp. *E News* July 11-**91** \* Apr 2-**92**; the Sulina mouth of, Kuhl, Hartley append., insets, *Inst C E* \* v 91 -**88**, inset \* v 106 -**91**

DELAWARE, obstructions in *Sci Am* Mar 16-**89**

ELBE, ht. prediction of, in Bohemia and Saxony, Harlacher, Richter, abs. *Inst C E* v 91; regulation between Melnik and Koniggratz, Oelwein, abs. v 92 -**88**; Sax., flow measurements, 1886-7, Ringel, abs. v 95 -**89**

JAMES, imp. at Richmond, Va., W. Adams *E News* Nov 22 -**90**

LOIRE, imps., Paris exhib., map *Eng* \* July 19, 26-**89**

MAIN, canalization between Frankfurt and Mainz, abs. *Inst C E* v 92 -**88** *Deut Bauz* -**87**

MISSISSIPPI imp., flood hts. in reach between Helena and Vicksburg, Starling, insets *Am C E* \* v 20 -**89**, keeping within banks, do. *E Mag* \* Apr -**91**; impending disaster on, June, prob., Dutton, Aug, Starling \* Nov -**92**

*E News* connecting with upper lakes, Handburg, Feb 18-**88**; Gov't. protective works. mat. Memphis \* Oct 26; levee con-

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- struct. Nov 9; bank protection \* Oct 26, Dec 14-**89**; flood of 1890, Harrod, Apr 5; Lower, protection from overflow, J. B. Johnson, 19-**90**; Sabine Pass imp., Turtle cor. Haupt *F Inst* Aug -**88**; hist., Redway (full) *Sc Am Sup* July 11, 18-**91**
- ODER, imp. at Cosel (Europe) *E News* \* May 3-**90**
- PORTLAND, W. T., imp., Freeman, inset *E Mag* \* Aug -**92**
- POTOMAC basin, hydrography of, Babb, discuss., inset *Am C E* \* v 27 -**92**
- RHINE reg. works, between Eltville and Oestrich, Imroth, abs. *Inst C E* v 92 -**88**; reg. at St. Gall, Wey, abs. v 103 -**91**
- RHONE, imp. of months of, Guerard, report abs. *Inst C E* \* v 101 -**90**. See also POWER, Rhone river at Geneva
- SEINE, lower, Suresnes locks and weir, Luneau, abs. *Inst C E* v 101 -**90** *An Ponts* \* v 18 -**89**; canalization of, abs. *Sc Am Sup* \* Mar 16-**89** *Genie Civil*
- STEERING and Wainfleet Haven imp. *The Eng* \* May 13-**92**
- SUSQUEHANNA floods, Raymond report *E Rec* Jan 23-**92**
- WEAVER nav., Sauer *E News* Aug 30-**90**; Stoney's sluices, Manchester ship canal *The Eng* \* Jan 9-**91**
- WITHAM channel and outfall imp. works, Williams, discuss., inset *Inst C E* \* v 95 -**89** *The Eng* Dec 7-**88**
- YELLOW *E News* Mar 31-**88**
- Rivet** signs, uniform system of *E News* Jan 25, cor. Feb 9, symbols, cor. \* Mar 2, Seaman, cor. \* Apr 13-**89**; diag. \* Sep 15 -**92**
- Riveted** joints, on an angle, expts., Flint *Am C E* \* Oct 27-**92**; copper, strength *Eng* \* Apr 24; \* Dec 4-**91**; riveting tests, Buckholz \* Dec 6-**90**; diags. \* Feb 6-**92**; net section in, Cooper *R Gaz* \* Aug 22; plates, tests \* Oct 10-**90**; Allen (full) *Sc Am Sup* \* July 18-**91**; of max. strength, Nicolson *The Eng* Oct 19, Nov 9, 30-**88**. See also BOILERS, riveted joints
- Riveter**, Allen pneu. *Eng* \* Nov 23-**88**; Schonbach's hydr. \* May; hydr., 200-ton plant \* Feb 14, 14-**90**
- Road** engines, rollers *Cassier's* \* Aug -**92**; locom, Burrell *Eng* \* June 20; steam on common roads, McLaren, Nov 21 *The Eng* Nov 21 *E News* Dec 20; locom., Aveling & Porter \* June 28-**90**; traction, European experience, McLaren \* Apr 4; the Springfield steam roller, inset \* Nov 21-**91**; Burrell compound *The Eng* \* Dec 12-**90**; 8 h. p. compound \* Sep 11 -**91**

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*E News* valuation of road metal and setts for paving, Stock, Sep 22 *The Eng* Aug 31-88; country, in France, construct. and maintenance laws *E News* Feb 6, 23, Mar 2; country, legislation in Pa. Apr 6; construct. and repair of, London, Strachan, 13; good, value of, May 18; common, N. Jersey law, July 27; Am. legislation, bk. n Dec 7-89

*E News* country, notes, Downing, Feb 8; foreign highway construct. and maintenance, 22, Mar 1, 15, 29; maintenance, Roads Imp. Assoc., Lond. \* Aug 16; repair and maintenance of, England, Sep 13; road work in Richmond Cty., N. Y. Dec 13-90; country, money value of good, report, Feb 7-91

*E Rec* road making, Herschel (prize treatise) Mar 9, Apr 20, 27, May 4, 11; Greene, Aug 10 *Harper's W* Aug 10, 17; good, Pope *E Rec* 31, Shaler, abs. Nov 9 *Scribner's*; Bridgeport macadam, North *E Rec* Dec 28-89

*E Rec* resist. to traction, Hering, Jan 25; Penn. highways report, Feb 15; construct. and maintenance, Thompson (prize article) Mar 29, Apr 5-19, Pritchard, 19, 26, May 3, com. comments, 10; main, maintenance, Hooley, Aug 10; machinery, cost of, Oct 4-90; European sts. and highways, Dec 12; Brookline, Mass. macadam, contract, 19-91

*E Rec* county, construct. and repair, Owen, Jan 30 *Sc Am Sup* Mar 12 *E News* Feb 13; road across a marsh, Waite cor. *E Rec* Feb 20; highway roller repairs, French system, Durand-Claye, Mar 5, Bacot, cor. 19; road making in eastern Mass., McClintock, 26; administration of French highways, Neff, Apr 16; Telford road making, Lenox, Mass. \* 30; instruction in highway eng., C. Allen, June 11, July 2, 23, (full) *Soc Arts Mass* -91; highway construct., disputed points, Owen, Nov 19 -92 *Am C E*

*Inst C E* roadways construct. across peat bogs, Schacht, abs. v 104 -91; highway, location, ed. *R & Eng* \* May -90; sections. Prov., R. I. \* July; Janvier *Sc Am Sup* Feb 27; legal

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responsibility for defective highways, Bly *St R J* Mar -**89**;  
Brighton foreshore imp. *The Eng* July 12-**89**. See also **MUNIC.**  
**eng**; **PAVEMENTS**; **STREETS**

**Road** vehicles, draught and haulage of *Sc Am Sup* \* Dec 5 *The Eng* \* Oct 16, cor. Dec 4 \* 11, 25-**91**

**Roanoke**, Va., survey of *E News* \* Jan 9 \* June 23 **92**

**Roberts**, Peter *Inst C E* v 96 -**89**

**Robertson**, Henry *Inst C E* v 93 -**88**

**Robertson**, James (full) *Inst C E* v 99 -**90**

**Robinson**, Moncure (full) *Am C E* v 26 -**92**, n *R Gaz* Nov 13-**91**

**Robinson**, S. S., por. *E & Min* \* Apr 11-**91**

**Rock**, drilling machine, hydr. *Eng* \* Feb 17-**88**; Dubois' boring machine, Paris exhib. July 12-**89**; M'Culloch's drill, Rio Tinto \* Sep 12-**90**; drills, Carbutt & Davey, Mar 27; and ore breaker, Gates I. Co., Chic. \* June 19-**91**; and ore crusher, Brennan *E News* \* Oct 18-**90**; removal under water without explosives, Lobnitz, inset *Inst C E* \* v 97 -**89**. See also **DISINTEGRATOR**; **DRILLS**; **MILLS**; **QUARRIES**; **STONE** and names of rocks

**Roe**, John P. *Inst C E* v 98 -**89**

**Roehricht**, Richard H. O. *Inst C E* v 106 -**91**

**Rogers**, William *Inst C E* v 95 -**89**

**Rolling** mill engines, reversing, Krupp works, Essen, Ger., inset *Eng* \* Sep 5-**90**; details \* Dec 4-**91**; 10,000 h.p., Jarrow *The Eng* \* Aug 9-**89**

**Rolling** mills, Simond's universal *Eng* \* May 25 *Sc Am Sup* \* May 5-**88** *Iron Age*; 15 in. 3- high blooming, Lack. I. & C. Co., Scranton, Pa., inset *Eng* \* Jan 23; rolling fluid metal, H. Bessemer \* Oct 9-**91**; failures of chilled iron rolls, Winder \* Oct 21-**92** *E & Min* construct. of passes in rolls for reducing metals, Hewitt, Aug 25 \* Sep 1-**88**; Am., evolution of, R. Hunt *E News* Nov 28, 28, (full) *R Gaz* Nov 20-**91** *Am M E*; universal, for girders and cruciform sections, Sack *Sc Am Sup* \* Jan 7-**88** *The Eng* \* May 10, 17-**89**. See also **STEEL**, German works

**Rome**, excavs. in ancient, Lubbock *Sc Am Sup* Mar 22-**90**; devel. of capital at, Hemphill, Oct 1-**92**

**Roofing**, slates, strength and weathering qualities, Merriman, discuss., insets *Am C E* \* v 27 -**92** *E & Min* Sep 24-**92**; paper for material *E News* Sep 21-**89**; roll tar paper manuf. (full) *Sc Am Sup* Sep 26-**91**; tiles glazing, terra cotta, etc. July 9-**92**

**Roofs**, det. of stresses in elastic systems by method of least work. Cain, inset (full) *Am C E* \* v 24-**91**; Cathcart st. station. Greenock R., inset *Eng* \* Mar 22-**89**; Fairfield works boiler shop, Govan \* Oct 3-**90**; July-Sep -**92**

*E News* 22d reg't. armory drill room, N. Y. \* Apr 13-**89**; truss failure, Troy, Ala., cor. \* May 9-**91**; trusses, coeffs. for figuring strains in, table \* Aug 11; 4-mile crib, Chic. \* Sep 15-**92**

*E Rec* 12th reg't. armory, N. Y., inset \* Jan 7; truss, So. Brooklyn R. car shed \* Mar 17; a cantilever \* Aug 4; St. Paul church \* Oct 27; rink truss \* Nov 17-**88**; So. armory drill-hall \* Apr 20; armory, Cin., O. \* Dec 7-**89**

*E Rec* iron mill \* Jan 25 \* Feb 1-**90**; arcade, Cleveland \* Mar 21, 28 \* Apr 4; erection traveler, Newport News Ship Bld. Co. \* Apr 25; Charleroi plate glass works \* May 9; iron shop \* Aug 29; strains in trusses *Locom* \* May -**91**

*R Gaz* Westinghouse machine shop \* June 6; rational trusses Arajol, June 27, cor. *The Eng* \* Oct 24-**90**; roof water removal, Porter *Sc Am Sup* \* May 18-**89**; iron *St R J* \* Aug -**90**; iron, So. Mahratta R. *The Eng* Oct 19-**88**; barracks at Aden, Aug 30, Sep 6-**89**; a rational truss, Graham \* May 16-**90**. See also BUILDINGS; EXHIBS., U. S. Columbian — U. S. Gov't. bld; FACTORIES; MILLS; Rs, stations, etc.

AGRIC. bld., Chic. exhib. *Eng* \* Apr 29 \* May 6-**92**

ALLEGHENY County court-house *E Rec* \* Nov 10-**88**

CARLISLE Corp. markets *The Eng* Mar 30, Apr 13, 13-**88**

CHICAGO Auditorium trusses *E Rec* \* Nov 22, 29-**90**

DULUTH Union depot *E Rec* \* Feb 6 \* Mar 12, 19, 26 \* Apr 9, 23, 30 \* May 21-**92**

DUNDEE R. station, Caled. R., inset *Eng* \* June 28-**89**

EDINBURGH exhib., inset *Eng* \* Apr 11-**90**

FOUNDRY plant, the Worthington, Elizabethport, N. J. *E Rec* \* Apr 2-**92**

HORTICULTURAL bld., Columb. exhib. *Eng* \* Nov 11, 18, 25-**92**

MACHINERY Hall, Columb. exhib. *E Rec* \* Dec 24, 31-**92**

MADISON Sq. Garden bld. *E Rec* \* Jan 17-31-**91**

MANUF's bld., Columb. exhib., insets *E News* \* July 28 \* Sep 1, 8-**92**

OLYMPIA, Nat. Agric. Hall, erection, Read *Eng* \* Dec 28-**88**

PARIS exhib., Machin. hall, inset *Eng* \* June 1-**88**; blds. \* May 3-**89**

**Roofs**, PENN. R., Jersey C. terminal station *Eng*\* Apr 1-92, train shed, inset *R Gaz*\* Oct 2-91

TRANSPORT. bld., Columb. exhib. *Eng*\* Dec 2, 9, inset *E News*\* 29-92

U. S. Columb. exhib. blds. *Eng*\* Oct 30, inset\* Nov 13-91 *E Rec*\* Aug; Gov't. bld. *Eng*\* June 10-92

**Rope** driving power transmiss., and cable, best speed of, Cooper, discuss. *Am M E* v 9-88; two haulage systems, Norris *E Rec*\* June 27\* July 18 *Am M E*\* v 12; C. Hunt\* v 12-91 *E News*\* Nov 15-90 *E & Min*\* Jan 31-91 *E Rec* Nov 15 *Pwr*\* Dec -90, Jan -91; Grimshaw *Cassier's*\* July, influence of longitude on, do. Oct; ed. *El Rev Lond* Sep 16-92; underground haulage, J. B. Smith *Eng*\* Feb 17\* Mar 2, 23; Otto system haulage\* Apr 6-88; Miller, diag. *E News*\* Dec 6 *The Eng* Dec 19-90

*Pwr* Seymour\* May-July\* Nov -89\* June\* Sep -90; at Willamette mills, Portland, Or.\* Jan -92; *Sc Am Sup*\* Mar 24-88; by manila ropes, Gregg\* May 24-90 *J Assoc E Socs*; *Sc Am Sup* May 24-90; \* Mar 24-88; *St R J*\* Apr\* Sep -90. See also POWER transmission; TELPHERAGE

**Ropes**, manila and hemp, strength and power transmiss., Miller, diag. *E News*\* Dec 6; *The Eng* Dec 19; and hitches *E Rec*\* July 19-90; strength of, Duboul. abs. *Inst C E* v 92-88, do. expts., French *R Gaz* June 29-88. See also CABLES; WIRE ropes

**Ropes** Pass, Texas, Kent *E Mag*\* June -92

**Ross**, George H. *Inst C E* v 95-89

**Rotary** boilers connections *Locom*\* Aug -90

**Rotary** engines, ancient and mod., Jamieson *Cassier's*\* Feb -92; Brown's *El Rev Lond*\* July 10-91; duplex *El Rev*\* Nov 29, n *El Wld*\* Apr 12-90; the Rota *Eng*\* July 20; Lidback's vibrating *F Inst Oct R & Eng*\* Nov; Bullock *Pwr*\* Apr; Rigg's *Sc Am Sup*\* Mar 10-88; revolving cyl.\* Nov 8: *The Eng*\* Mar 7, valve gear\* Apr 25-90, \* Jan 23; hydr. winding with variable stroke\* Oct 16-91

**Rotary**-piston valve, engine governing by, Aldrich *Am M E* v 13-92

**Rotary** pumps, Johnson's *The Eng*\* July 3, boiler feeder\* Dec 25-91. See also PUMPS, rotary

**Rouen** port, France *Eng*\* Oct 11-89

**Routing** machine, Parry's *Sci Am* Mar 23-89

**Routledge**, Thomas *Inst C E* v 92 -88

**Rowland**, Henry A., por. *El Wild* \* Mar 9-89

**Royal** Institution Soc., Lond. pro. *El Rev Lond* May \* June 12-26-91; *Eng* May 16, 23-90, May 22, 29, June 5-26, July 3, 10, Dec 18, 25-91, Jan 8-22, Feb 12, Mar 4, 11, 25, June 17, July 22, Aug 12, 19, Dec 9, 30-92; pors. members *Sc Am Sup* \* Sep 7-89; June 14-90

**Rubber**, india, properties, in Russian navy, Vladimiroff, abs. *Inst C E* v 109 -92; *Sci Am* Apr 6-89; vulcanization of, Gerner *Sc Am Sup* Jan 4: \* July 12, Sep 6; indus., hist. (Hayward's expts.) Oct 18; vulcanization and decay of, notes, W. Thomson, Dec 6-90; supplies sources, Sherman, Feb 6; gathering in Amazon valley, Kerbey, Mar 19-92. See also GUTTA-percha

**Rundle**, Cubitt S. *Inst C E* v 100 -90

**Russ**, William *Inst C E* v 104 -91

**Russia**, commerce and mineral industries, ed. *Eng* Dec 25-91; diagonally through, ed. cor. *E News* Oct 11, 18-90

**Russian** sheet iron *Sci Am* Feb 2-89

**Ryan**, Jeremiah *Inst C E* v 107 -92

**Sabine** Pass imp., cor., Turtle, Haupt *F Inst* May -88

**Sacre** Charles R. *Inst C E* v 98 -89

**Safety** lamps, the Thorneburry *Eng* \* Nov 15-89; miner's, notes, Hughes *E & Min* \* Mar 28-91

**Safety** valves, lever (full) *Locom* \* July -92

**Sahara**, the, James *Locom* Aug -89 *Sc Am Sup*

**Sails**, action of, Vogt, cor. *Eng* \* Oct 11 *Sc Am Sup* \* Dec 21-89

**St. Louis**, Mo., pavements, Macklind *E News* Mar 14; topog. survey of, Connet, Oct 31-91; pub. works management, Jan 23; new growth of, Ralph *Harper's M* \* Nov -92. See also PAVEMENTS; SEWERS; STREETS; WATER-works, etc.

**Salida**, Col., inset *E & Min* \* Dec 21-89

**Salmond**, John M. *Inst C E* v 102 -90

**Salt**, works, obtaining brine, Brush, Tully Pipe Line Co., N. Y., discuss., insets *Am C E* \* v 23 -90 *E News* July 5-90; the Petite Anse mine, La., Pomeroy *Am Min* \* Apr 17-89, Bolton *Sc Am Sup* July 28, Pomeroy \* Nov 10 *E & Min* \* Oct 6-88; manuf., Pick's system in vacuo \* July 12-90; wells, Onondaga. '90, Engelhardt, Feb 21-91; U. S. produc., do. Jan 2; manuf. China \* Feb 6-92

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**Salter**, Frank *Inst C E* v 96 -89

**Samoa** *Century* May -89

**Sand** pumping, dredging and Mersey bar, ed. *Eng* Apr 11-90

**Sandstone** indus., U. S., Day, Cens. bull. abs. *E & Min* July 4  
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**Sanitary** engineering, Manchester, England, ed. *Eng* Sep 30; bad air in theatres, Montgomery *E Mag* May -92; san. sci. in the home, Richards *F Inst* Aug; safety in house drainage, Hoyt *Pop Sci* July; Bayles *Sc Am Sup* Dec 15-88; legislation, England, results, Calkins, inset *Tech Q* \* Dec -91. See also BUILDINGS; Health; MUNIC. eng; PLUMBING; REFUSE disposal; SEWERAGE

**Santoy**, John B. Austis du *Inst C E* v 96 -89

**Saw** machine, double band, for deep cutting *The Eng* \* Mar 8-89. See also BAND saws

**Scales**, comparison of binary and decimal. table *Locom* Dec -88

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**Scarlet** fever, etiology of. Klein *Sc Am Sup* Jan 21, Mar 17-88

**Schaufuss**, Erich C., Bowden *Am Min* v 17 -89

**Schiscophone** (flaws in metals) ap. *Sc Am Sup* \* July 5 90

**Schliemann**, Heinrich, por. (full) *Sc Am Sup* \* Feb 28, Manatt, 28-91

**Schmidt**, Bernhard *Inst C E* v 96 -89

**Schneider**, Henry W. *Inst C E* v 92 -88

**Schools**, engineering, plea for the printing press in, Hawkins *Am ME* v 9 -88; technical, of Am., Purdue Univ., La Fayette, Ind., Goss, pors. *Cassier's* \* Aug -92; Lond. Tech. Inst., Tunzelmann *Eng* \* Nov 2, inset 16-30 \* Dec 7, 21-88; Steven's Inst., Hoboken, N. J. \* June 7-89; Cornell Univ. & Sibley Coll. Aug 22; Finsbury tech. coll. Nov 21-90; Brown Univ., Prov., R. I. \* Sep 11-91; manual training *E & Min* Feb 1 -90

*E News* premiums for graduating theses, Jan 30; Mass. Inst. of Tech. July 14, 21; Cornell Univ. 28; Lawrence Sci. reorganization, Sep 22-92; education, value and drawing and hand-

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*Tech Q* Mass. Inst. of Tech., beginning, Munroe, May -88; sci. and tech., place of in Am. education, Walker, Dec -91; English composition in colleges, Carpenter, Oct -92. See also EDUCATION; ENGINEERING schools

**Schopenhauer**, Arthur, por. *Sc Am Sup* \* Apr 21-88

**Schwarz**, T. E., por. *E & Min* \* Aug 29-91

**Science**, Smithsonian Inst. reports, bk., Gov't Printing Office, Wash; is science disciplined knowledge, Varley *El Rev Lond* Jan 2, 9-91; prog. in '89 *E News* Jan 4-90

*F Inst* limits of scientific inquiry, Hensoldt, May; applied, possibilities of, O. Smith, June -91; notes, see *F Inst* files; recent Kropotkin *19th Cent* May, Aug, astron., Mars, biology, human muscle, Dec -92; circle of the sciences, Coleman *ut* Oct -88; scientific socs. of Italy, Cahall *Pop Sci* Nov -92

*Sc Am Sup* hist. of a scientific doctrine, Langley *Sc Am Sup* Oct 27, Nov 3-88; the man of sci., Thurston (full) Jan 2: natural relation to art, Du Bois-Reymond, Feb 20-92; beginnings of, Calkins *Tech Q* Apr -91; measuring earthquakes, ozone ap., Roy. Inst. pro. *The Eng* June 29-88

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**Stephens**, Frederick C. *Inst C E* v 96 -**89**

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- Stereotyping**, quick proc. *Locom June Paper Wld, Sc Am Sup* Aug 4-88; Bolas (full) Oct 25 \* Nov 1-90, Feb 21-91
- Stevenson**, George W. *Inst C E* v 99 -90
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- Stileman**, Francis C. *Inst C E* v 98 -89
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- Stokers**, aut. conveyor *Eng* \* June 14, 28; Roney *Pwr* \* Aug *St R J* \* Aug -89. See also BOILERS, stokers; MECHAN. stokers
- Stollmeyer**, André B. *Inst C E* v 107 -92
- Stone**, Mason's stone-breaker *Eng* \* Nov 25-92; Gov't. contracts *E News* June 2; and cement, crushing strength, Baker, 23-88; cost of dressing. Cooke, Dec 13-90; cements and bld. material, method of testing resist., Durand-Claye *E Rev* May 11, abs. *Inst C E* v 95 -89 *An Ponts* \* v 16 -88; stone-cutting and quarrying by wire, abs. *Inst C E* v 95 -89; sawing machines, abs. v 106 -91; Ark. syenites tests, Wins *R & Eng* Jan -91; artificial 'Ferroid,' Poole *Sc Am Sup* Nov 8-90 *J Assoc E Socs*; circular saw *Sc Am Sup* \* May 2 -91; artif. silica making, Aug 20-92. See also BLUESTONE; BUILDING stones; GRANITE; LIMESTONE indus; SLATE, etc.
- Stone**, Charles S., Raymond *Sc Am Sup* Mar 23-89 *E & Min*
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- Storage** batteries, elec., or accums., Salom *Am Min* \* v 18 -90; Reckenzaun *El Rev Lond* Jan 6, June 22, July 6, 13, Aug 3, 24, Nov 9 *El Rev* Dec 1-88 *Sc Am Sup* Feb 2-89 *El Eng* Sep, Oct -88, Jan; litigation. Apr; defects of lead secondary, Duncan \* June *El Rev Lond* \* July 19, dis. (full) *E Wld* \* June 15-89 *El Eng* in train lighting, Brown, dis. July; regulating accums. in elec. lighting, methods, Prescott (very full) \* Nov, (full) *El Rev Lond* \* Nov 22, 29, Dec 6, (full) *El Rev* \* Nov 9, (full) *El Wld* \* Nov 9, dis. 23; chem. of, Frankland, Oct 25-89, Aug 22-90 *El Rev* Nov 2-89, expts. Sep 20-90 *Sc Am Sup* Nov 2-89, Nov 1-90 *El Eng* Nov, Dec -89
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**Surveying**, N. Y. State, final results of triangulation of, Weed, Parsons, Albany, '87, bk; bench marks, expts. on stability of, Cooley, dis. *Am C E* v 20 -**89**; deep rock cuts, method of taking cross-sections in, by triangulation, Watkins, insets \* v 22 -**90**; imaginary boundaries, Raymond *Am Min* \* v 18 -**90**; photographic, and co-ordinate, Stanley (full) \* v 20 -**92** *E Rec* \* July 2 -**92**; the ordnance, methods and proces., Wilson *Eng* Feb 27 -**91**; U. S. Geolog., costly, Wolcott *E Mag* Nov -**92**

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*E News* field-books, notes, Rothwell, Apr 5; acreage table for comput. right of way areas, June 14; grades at st. intersections, cor. \* 21; Brit. ordnance, Oct 18; prob. \* Nov 1; the Porro telescope for stadia work. J. B. Johnson \* 8-90; Roanoke, Va. \* Jan 9 \* June 23; field sheet for topog. work \* July 28; surveyor's qualifications, Gov't. Cape Col., So. Africa, Aug 4-92

*E Rec* how to tell a good instrument, Lietz, Apr 11; St. Louis, Mo., topog. Oct 3-91; topog. methods, K. Allen \* Feb 6-92; Tacheometry, or rapid, Brough *Inst C E* \* v 91; plane-table, econ. use in topog., Pierce, dis., inset (full); chaining, imp. systems, W. Thompson *Inst C E* \* v 92, 92-88

*Inst C E* Hawaii, Windward, prelim. in new countries, Gribble; rapid, Topham; in Australian colonies, Vickery. v 95-89; by vertical angles, probable errors, Airy; triang. errors, short method of distrib; France, leveling, Jimels, abs. \* v 101, 101-90 *Genie Civil* v 17-90

*Inst C E* land, astron. as applied to, Downes \* v 108; spirit leveling of Switz., Messerschmitt, abs. v 109-92 *Schweiz Bauz*; Italy, geodetic map *R & Eng* \* Nov-88; France, geodetic work, Aug-89; prob. \* Dec-90; hand telescope for stadia-work, Richards *Tech Q* \* Apr-92. See also INSTRUMENTS; TUNNEL surveying

**Swallow**, James S. *Inst C E* v 101-90

**Sweet**, John E., por. *Cassier's* \* Apr-92

**Switzerland**, stat. *E News* Aug 3-89

**Sylvanite** mine, Col. *E & Min* \* Dec 15-88

**Sylvester**, James J., por., Cayley (full) *Sc Am Sup* \* Apr 13-89

**Szegedin**, Town of, reconstruction (after flood), Stübben, abs. *Inst C E* v 92-88

**Tabulating**, elec., Hollerith system, com. report *F Inst* \* Apr-90; statistical tab. by machinery, Pidgin *Soc Arts Mass* -89. See also CENSUS taking

**Talc** *E & Min* May 25-89

**Talking** machine. See PHONOGRAPH

**Talman**, James J. *Inst C E* v 110-92

**Tank** sluice with equilib. valve, Larmunie *E News* \* Feb 14-91

**Tannin**, chestnut wood bark, Trimble *F Inst* Oct -91, May -92

*Sc Am Sup* Nov 14 -91

**Tanning**, elec., Worms & Bale ap. *El Eng* \* Nov 26; creosotic acid employment in, Hauff *Sc Am Sup* May 3; anal., Muter \* Sep 6 -90; materials of Europe, May 23; by aid of electric., Rideal (full) \* Aug 8 -91; plants capable of yielding materials, Mafat, Oct 8 -92; applic. of alpha-sulphonic acid of naphthaline to bating and puring of hides, Burns *Tech Q* July -91; theory and practice, Salomon, Apr -92. See also ELEC.—LEATHER tanning

**Tarbotton**, Mariott O. *Inst C E* v 91 -88

**Tar** furnace, Anderson *Sc Am Sup* \* Feb 11 -88

**Tariff** and the constructive arts, Thurston *Cassier's* Jan -92

**Taxes**, U. S. *E News* June 1 -89

**Taylor**, John *Inst C E* v 109 -92

**Teaching** of science, com. report (full) *Sc Am Sup* Jan 25, Feb 1 -90. See also SCHOOLS; SCIENCE

**Technical** Soc. of Pac. Coast, Geldern, pors. *Cassier's* \* Oct -92

**Telegrams** and storms, Slingo *El Rev Lond* Jan 23, 30, Feb 6-20 -91

**Telegraph** *El Eng* wire, hard drawn cop., durabil., Maver, Apr -88; line adjust., Delany \* Dec *El Rev* \* Nov 30 *El Wld* \* Apr 27 \* Nov 30, multiplex, new sys., Patten's (full) *El Eng* \* Mar -89 \* June 18; circuits, Jones' main office \* Dec 17 -90; writing tel. \* June 3 -91

*El Eng* mod. Am. ap., F. Jones \* Mar 30, May 25 \* June 22 \* July 27 \* Aug 3, 17; wire joints, breaking strain in hard drawn cop., Jones, June 1; type, the Am. n \* July 27; cable, Burke relay and transmitter \* Dec 7 -92

*El Rev Lond* R. survey system, Gilbert \* May 18; transmiss. limit, Moon, Aug 10; submar. cables and ocean temps., Bright, Nov 16 -88; cables, of world, Feb 15; Siemen's recording ap. for compact Morse writing \* Mar 8; Submar. Co. 29; ocean probs. and conditions, Apr 5; trans-atlan. cable routes \* Aug 2, map *El Wld* \* July 27; high vs. low speed, finan. compar. *El Rev Lond* Aug 16, Linckens *El Rev* Sep 7; cable manuf. early hist. *El Rev Lond* Dec 13 -89

*El Rev Lond* submar. cables, aut. reversal signaling on \* Feb 7; protection, lightning guards, Lodge \* May 16-30; elec. curs. in conductors, Bennett \* July 25; sub. cables, interrupts. and repairs, '88-89, table, Aug 22 -90; prog., '96, Feb 6, in England.

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Preece, Sep 18; sub. cables, India-rubber core in \* Mar 20; pictorial \* Dec 4-**91**; ap. constants, Moon, Apr 29; sub. cables, double differential relay, Raymond-Barker \* July 22-**92**

*El Rev* hist., Vail May 5 *Century* Apr -**88**; cables, broken ocean, Oct 5; multiple, synchronism in, Morse, Nov 16; cable manuf. hist., Barrett, 23-**89**; tournament (fast sending) \* Apr 12, 19; curs. in conductors, obs., Bennett \* Aug 23; writing, prins. of, Morse \* Nov 15-**90**

*El Rev* and telephone, inventors of, Gray addr. Apr 18 *El Wld* 25 *E Mag* June 20 *Sc Am Sup* 20; and pat. stats., Brit. *El Rev* June 27; musical. Hachenberg, por. \* Nov 14; a pub., Hale, Dec 5-**91** *Cosmopol*; in Am. *El Rev* Feb 20-**92**

*El Wld* dynamo-elec. machines in, West. Un. bld., Maver \* Feb 11, 18; quadruplex, imps. do. \* May 19, 26 \* June 2, cor. \* Oct 27; trans-pac. cables, proposed, table, July 14; Gray telautograph \* Aug 11; with pulsatory and undul. cur. sigs., Maver \* 25 \* Sep 8, 22 \* Oct 6; and telephony, Jacques' simul. system \* Nov 17-**88**

*El Wld* ocean probs. and conditions, Weatherbee \* Jan 26; imperfect earth in circuits, phenom., Kenelly \* Mar 16; line construct., Paris exhib. \* Nov 9-**89**; quadruplex, Healy \* Jan 18; submar., Webb (full) Mar 1, (full) *Sc Am Sup* Apr 19; fast sending contest *El Wld* \* Apr 19; signaling across rivers, India, Melhuish \* May 10; nationalizing, Wiman, Dec 30 -**90**

*El Wld* electric., galv., mag. and teleg., chron. hist., Mottelay (very full) \* Apr 18-Dec 26-**91**, Jan 2-Feb 27, Sep 3, pors. \* 10-Oct 22-Dec 31 etc. -**92**; the phonopore, Langdon-Davies *Sc Am Sup* \* May 18 *The Eng* \* June 21-**89** *El Wld* \* Mar 7; and teleph. indiv. selection on elec. circuits call sys. \* July 11; Gov't., Rosewater (full) Dec 12, Gov't. control, Foote, 19 -**91**

*El Wld* pictorial, Trotter \* Jan 16; the Wentz line adjuster, Rosenbaum \* Feb 20; lines earth cur. disturbs., Finn \* May 14; cable relays, Judd \* Nov 5-**92**; multiplex, the phonophore *Eng* \* Apr 19; at Paris exhib. \* Aug 16, 23 \* Oct 11, Post Office, Oct 25, Nov 1-**89**

*E News* the Am. inventors of the, ed. Apr 14, birth of the elec. 21; the Finley helio-teleg. 28-**88**; trans-Atlan. cable lines \* Mar 29; the world's lines, Oct 25; cables. internat. sys., Hen- niker, 25-**90**

**Telegraph**

*F Inst* the writing, Gump, Oct -88; cable, Delaney \* July. (full) *Sc Am Sup* \* Aug 31 \* Sep 7-89; foreign curs. balancing effects, Fletcher *Inst C E* \* v 94 -88; sub. cables resist. measurement, Rouillard, abs. v 95 -89; sub. Pac. cable, projected *Locom* Nov -91; Gill-Alex. indiv. call *R Gaz* \* Mar 13; secret service indiv. call \* Aug 28-91

*Sc Am Sup* Morse and first line, Feb 25-88; trans-atlan. cable lines \* Apr 26-90; transmiss. of messages through the air without wires, Trowbridge \* Feb 21; between Great Brit., Europe, Am. and the East, Niven \* Mar 28; first message, Vail, Nov 14-91; of to-day, Buckingham *Scribner's* July -89

CHINA, and R's, Hitchcock *E News* \* Nov 17-92

DELANY's sys. of private line *El Eng* \* July 20-90; aut. *El Wld* \* Feb 2; line adjusting *R Gaz* \* Nov 1-89

EUROPE, Gov't. tels. of, Rosewater *El Eng* Dec 9, dis. 16; Niven *Sc Am Sup* \* Mar 28-91

MERCADIER multiplex sys., abs. *Inst C E* v 106 -91

PARIS-New York Co. *El Rev Lond* July 29-92

PATTEN's multiplex sys. *El Wld* \* Jan 26, (full) \* Feb 23, dis. Mar 9-89

POSTAL, Brit. Post Office *El Rev Lond* Apr 5-89; *El Rev* Dec 5, Gov't. control, Rosewater. dis. (full) 12; Great Brit. sys. *The Eng* \* Dec 18-91. See also POSTAL telegraph

SPECTRO-tel., Dresing *El Rev Lond*, *El Wld* \* July 21 *Sc Am Sup* \* Aug 4-88

STENOTELEGRAPH, the Cassagnes (stenography at a distance), Chenut *El Wld* \* July 19 *Sc Am Sup* \* Aug 16-90

TYPE printing, Wright & Moore's *El Rev Lond* \* Mar 1 *Sc Am Sup* \* June 8-89 *Iron*

WESTERN Union Co., U. S., reports *El Eng* Nov -88, Dec -89, N. Y. equip. (full) Jan 27-92; reports *El Rev* Oct 19-89, Oct 22-92

WEST Indies, competition map *El Rev Lond* \* Dec 26-90

**Telegraph** Engr. Soc. pro. *El Rev Lond* Jan 13-27, Feb 3, 17, 24, Mar 2-16, 30, Apr 20, 27, May 4, 18, 25, June 18; *Eng* May 25-88

**Telegraphophone**, the Wheless *El Wld* \* Sep 14-89

**Telemeter** system *El Wld* \* Sep 21-89; Fiske's (marine dist. instrum.), Brylinski, abs. *Inst C E* v 106 -91 \* *An Telegr* -91; Gautier's pocket (rapid dist. measuring), Robbins *Tech Q* \* May -89

**Telephone** *El Eng* transmitting speech by interrupted elec. curs., Kintner \* Jan *El Rev Lond* \* Jan 20, 27; and electric light and power circuits, elec. relations, Lockwood *El Eng* Oct -88; interference cases (very full) Mar; induced cur. strength with magneto-teleph. transmitter, Cross, May -89

*El Eng* induction \* Jan; eng., Carty, May 21 *El Rev* May 24; spec. induc. capac., Jacques *El Eng* Oct 1-90; inductive disturbs. in circuits, Carty \* Mar 25, dis. Apr 15 *El Rev Lond* Apr 10 *El Rev* \* Mar 28, *El Wld* \* 28, dis. \* Apr 11 *Sc Am Sup* \* May 9, expts., Kennelly *El Eng* \* May 6, 13-91; signals, selective or indiv., Lockwood \* June 8 *El Rev* \* June 18 (full) *El Wld* \* 11; eng., Webb *El Eng* \* Sep 7; connecting stations with exchange office by single line, Zetsche \* 21-92

*El Rev Lond* batteries, Pickernell, Oct 19 *El Rev* Sep 15-88; telephony, Hibbard *El Rev Lond* Oct 18; induction, Carty \* Dec 6, dis. *El Rev* \* Nov 30 *El Wld* \* 30 *Eng* \* Dec 20-89; French *El Rev Lond* Jan 10; exchange construct., Pickernell, Oct 17-90; receiver, influence of strength of magnet in, Cross \* Feb 20; telephoning great cities, Bennett (full) \* Sep 4, 11, 11, ed Oct 2, 16, Nov 13 *Eng* \* Sep 11; and telegraphy, prog. in England, Preece *El Rev Lond* Sep 18-91; domestic telephs. \* May 13-27-92

*El Rev* limits of speaking teleph. lines, Wietlisbach, May 18; Paris exhibit, Sargent, Sep 21, convention, 21; Enzmann's telephonic relay and phonopore \* Nov 2-89; principles underlying acoustic telephony, Cross, Feb 8; convention (full) Sep 20; Co's corporate organization, Hall, 20; Root's (box) aut. pay station \* Nov 22-90; the McCluer toll-box \* Jan 24; telephony, new method of study, Cross, Feb 7; and telegr. inventors of, Gray addr. Apr 18 *El Wld* 25 *E Mag* June 20 *Sc Am Sup* 20; first exchange, New Haven, Ct. *El Rev* Jan 2; ten years with, Barrett \* Feb 20-92

*El Wld* telephony, Touanne, Sep 14-89, duplex, Oct 23-86, Jan 4-90, Barrett \* Jan 18; submar. cables for long dist., Preece, Oct 4-90; disturbs., Kennelly, Apr 11-91; U. S. indus. June 18; Co. operating, Foote, July 9-92

*E Mag* chat with Europe, Webb, Apr -91; indus. future, do. Mar -92; teleph.-equation, Madsen, abs. *Inst C E* v 95 -89; effects, intensity and equality, Mercadier, abs. v 108-92; elec. boxes *Sc Am Sup* \* Jan 21; interferences of dynamo curs., McCluer, Oct 13-88; telephone girl, Nelson, Feb 20 92

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*Tech Q* magneto transmitter, strength of induced cur., Cross \* Feb -**89**; magneto receiver, influence of strength of magnet, do. \* Nov -**90**; telephony, studies in Rogers lab. of physics, Mass. Inst. Tech., do. *Soc Arts Mass* -**89**; new method of study in, do. -**91**

ALBANY, Hudson river Co. *El Rev* \* Dec 10-**92**

AM. Bell Co., report *El Eng* Apr, decis. May -**88**; reports *El Rev* Apr 7-**88**, Apr 6-**89**, Apr 5-**90**, Apr 11-**91**, Apr 9-**92**; U. S. vs., pat. decis., law (full) *El Wld* Mar 24, 31, (full) *El Rev* Mar 31, May 5 *Sci Am* Nov 24; reports, Apr 7-**88**, Apr 6-**89**, Apr 11-**91**

BELL'S water-jet transmitter, Tunzelmann *El Wld* \* Aug 11 *Sc Am Sup* \* Sep 8-**88**

BERESFORD, the *El Rev Lond* May 27, June 10-**92**

BOSTON exchange *El Rev* \* Aug 1-**91**

COLLIER audible *El Wld* \* July 18-**91**

DENVER, induction and interference with service *El Eng* Apr 16 -**90**; system *El Rev* \* Feb 9-**89**

DETROIT Exchange Assoc. *El Eng* Sep 17-**90**

EDISON'S carbon pats. *El Rev* \* May 14 *El Wld* \* 14-**92**

GRAMOPHONE, Berliner *El Eng* \* Dec 31-**90** *El Wld* \* Jan 3-**91**. See also GRAMOPHONE

HOWARD'S ap. *El Rev* \* Oct 31-**91**

JACQUE'S sys. of simul. telegr. and telephony *El Wld* \* Nov 17-**88**

LONDON-Paris, Eng. Channel submar. line, Preece *El Rev Lond* \* Aug 28; Webb *El Rev* Mar 28, Apr 11. Preece \* Sep 26 *El Wld* \* Oct 3; *Eng* Mar 20, Preece, Sep 4 *Sc Am Sup* \* Oct 3 -**91** *El Eng*

LONG distance, 950 miles, Dickson *Cassier's* \* Nov; Webb (full) *El Eng* \* May 4, 11; N. Y. - Chic. line, eng. details, Wetzler \* Dec 14; 1,000 miles by, N. Y. - Chic., pors. *El Rev* \* Oct 29; Neilson *El Wld* July 9; *Sc Am Sup* Jan 9-**92**; *Locom* May -**88** *El Rev*

MICROPHONE, evolution of, Tanner *El Wld* \* Dec 13 *El Rev Lond* \* Nov 21; transmitter, excursion of electrodes, Cross, Oct 31 *Tech Q* Aug *El Rev* Nov 1-**90** *Tech Q*; Blake contact expts., Patterson *El Rev* May 5 *Tech Q* Feb -**88**; Barrett *El Rev* Mar 19-**92**; transmitter, Berliner pat. (full) *El Wld* \* Nov 28, 28-**91**; cur. strength, Sabine, Cross *Tech Q* Feb -**89**. See also MICROPHONE

**Telephone**, NAT. Exchange Assoc. pro. *El Eng* Oct (full) *El Rev* Sep 15-**88**; *El Rev Lond* June 7-**89**; (full) *El Wld* Sep 15-**88**, Sep 21-**89**, Sep 20-**90**

NEW England Teleph. & Telegr. Co. reports *El Rev* May 18-**89**, May 17-**90**; quarters *El Wld* \* Aug 1-**91**

NEW York city, service *El Eng* \* Sep 10-**90**; underground wire work *El Rev* \* Mar 16-**89**; Met. Exchange \* Sep 13-**90**, station *Sci Am* Mar 30-**89**

PHILA. Bell Co. plant (full) *El Eng* \* Feb 10, report, Apr 6-**92**

PULSION, the *Eng* \* Dec 6-**89**

ROSEBRUGH duplex system *El Wld* \* Jan 4 **90**

SWEDEN & Norway *El Rev Lond* Aug 1 *Eng* Dec 12-**90**

SUTTON's system *Sc Am Sup* \* Feb 28-**91**

SWITCH-board, Vail & Seely's *El Rev* \* July 14-**88**, McClure's multiple \* Feb 21-**91**; switching, Wordingham, inset *Inst CE* \* v 100-**90**

UNITED Co., an. meeting *El Rev Lond* July 6-**88**, report, June 7-**89**

VAN Size's exchange system *El Wld* \* Dec 8-**88**

**Tele-photography**, Sutton *El Rev Lond* \* Nov 7-**90**

**Telescope** grinding machine, Common's 5-ft. mirror (full) *Eng* \* Oct 28 \* Nov 4, 11, inset, 18, 25-**92**

**Telescopes**, hand, for stadia work, Richards *Am Min* \* v 20-**92** *E & Min* \* May 14 *Sc Am Sup* \* June 11-**92**; object glasses *Sci Am*, *Eng* \* Jan 6; for stellar photog. \* Apr 27; astronom., clock driving ap. for, Grubb \* Oct 5 *The Eng* Aug 10-**88**; hist., Holden *Sc Am Sup* Jan 21; Manchester exhib. \* 28; great, of world, Rees, Mar 3-**88**; pyrometric \* Mar 1-**90**; Lick equatorial 36-in., Keeler *The Eng* July 6-**88**

**Telpherage**, two rope haulage systems, Norris *Am M E* \* v 12-**91** *E & Min* \* Aug 8, 15; aerial wire ropeways, Pohlig, inset (full) *Am Min* \* v 19-**91**; cable transfer for R. cars, Spilsbury \* v 20-**92**; and elec. R's of Edinb. exhib., Manville *El Rev Lond* Oct 17-**90**

*El Rev* elec. transport., Parcelle \* Aug 9; double track elevated elec. wire road, for mining and mills *El Wld* \* Jan 4-**90**; Sprague elec. aerial tramway *E & Min* \* July 28-**88**; Lidgerwood suspen. cableway, Ogden mines, N. J. \* Oct 10-**91**

*E News* the Portelectric carrier, May 25-**89**; Suspen. Transport. Co., Chandler's pat. wire ropeway \* July 12-**90**; Plomo-

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sas wire ropeway, McIntire \* Mar 21 *Sc Am Sup* \* Feb 21 *R Rev* the Garrucha aerial, Spain \* July 25 *R & Eng* \* Aug *Industries*; suspen. cableway at Austin dam, Tex. *E News* \* Nov 14-**91**; long span wire rope, Howland, Me. \* Apr 2 -**92**

*Inst C E* Gourjon system wire ropeways, Gros, abs. v 93 -**88** *An Ponts* \* v 14 -**87**; Beer system, Raoult, abs. *Inst C E* v 95 -**89** *Rev Mines* v 3 -**88** *Sc Am Sup* \* Dec 15-**88**; Ayrton, Perry, Jenkins', at Glynde, England, Fernald *Pop Sci* \* July -**90**; wire rope transport. and transmiss. *R Gaz* \* Oct 7-**92**

*Sc Am Sup* Otto pat. wire ropeway (full) \* June 22-**89**, Gottesegen coll., Silesia, *The Eng* Dec 28-**88**, inset \* Jan 25 \* Feb 8, 8-**89**; Ry., elec., Edinb. exhib. \* July 11 *Sc Am Sup* \* Aug 30-**90**; aerial, Landun sugar works, France \* June 13-**91**. See also ELEC., Portelec; ROPE driving; WIRE rope

**Tempel**, William, Schiaparelli *Sc Am Sup* July 13-**89**

**Temperatures**, at various depths, L. Cochituate, Boston, diag. *E News* \* July 26-**90**; absolute zero *R Gaz* Sep 30-**92**. See also EARTH temps; THERMOMETERS

**Tennessee** and Ala. *Eng* \* Oct 5 \* Nov 2-**88**

**Tesla**, Nikola, por. *El Wld* \* Feb 15-**90**, and his business *Sc Am Sup* \* May 21-**92**

**Testing** machines, aut. recording ap., Gray *Am M E* v 13 -**92** *Cassier's* \* Oct -**92**; the Emery, Towne *Eng* \* May 11-25, 75-ton, inset \* July 6, dis., insets (full) *Inst M E* \* May, Oct, at Watertown arsenal *The Eng* Jan 20-**88**

*Eng* Kennedy's 50-ton laboratory \* Sep 12 *The Eng* \* July 18-**90**; hydr., 1200 tons capac., Phoenix I. Co., inset *E News* \* Jan 10; the Olsen and com. report *F Inst* \* Feb; alternative-center, Walker eng. lab., Liverpool, Hele-Shaw, insets *Inst M E* \* July -**91**

**Testing** materials, uniform methods, com. report *Am C E* v 26-**92**; and sampling works, St. Louis *E & Min* \* Feb 11-**88**; standard methods *E News* Mar 7, Aug 22; Kirk system, Hunt, Sept 19-**91**; Malines Gov't. works, Belgium, Roussel *Inst C E* \* v 91 -**88**; metals, influence of time in, Bauschinger (full) v 107-**92**; Charlottenburg station, Germany *R & Eng* Aug-**90**; labs., Master Mech's com. report *R Gaz* June 26-**91**; repeated stress, expts., Sondericker *Tech Q* \* Apr -**92**. See also BEAMS; CAST iron; MATERIALS, inspection; STEEL, expts.

**Texas**, geological survey *E & Min* Apr 5-90

**Theatre**, Terry, Court and Garrick, structural ironwork in, London *The Eng* \* Feb 1-89

**Thermic** motor of the future *Sc Am Sup* \* Apr 25-91

**Thermo-dynamics**, difficulty. Mansel cor. *The Eng* Nov 1, n 15-89, Bower cor. \* Aug 5, Sep 23 \* Dec 2-92

**Thermograph**, Draper's *Eng* \* Feb 14-90

**Thermometers**, mercurial, expts. to det. rate of rise or fall, Nagle *Am M E* \* v 13 -92; new scale, Forbes *E Wld* Oct 12-89; correcting *Locom* Dec -88, Jan; Browne (full) *Sc Am Sup* \* Sep 14-89; calibration method at many points, Holman *Tech Q* \* Sep -87

**Thermo-motor**, the Hargreaves *The Eng* Jan 27; and heat engines, R. H. Smith, Feb 3-88

**Thomas**, Edward C. G. *Inst C E* v 99 -90

**Thomas**, Sidney G., bk. review *E & Min* Aug 8-91

**Thompson**, Silvanus P., por. *El Wld* \* Jan 9-92

**Thomson**, Elihu, por. (full) *El Wld* \* Sep 1-88

**Thomson**, James *Sc Am Sup* July 9-92

**Thomson**, William, por. *El Eng* \* Jan 13, por. *El Wld* 16-92, por. (full) *Sc Am Sup* \* Mar 9-89

**Thorman**, Edward H. *Inst C E* v 109 -92

**Thrashing** machine trials, Doncaster *The Eng* \* June 26, July 3, 10-91

**Thurston**, Robert H., por. *Cassier's* \* Nov -91

**Tide** gauge, aut. self-registering, n *E News* \* July 28-88

**Tides**, tidal volume, d'Auria *F Inst* \* Apr, law of variation \* May; range in rivers and estuaries, Gieseler, Aug -91; the bore of the Tsien-tang-Kiang, Moore *Inst C E* \* v 99; continuous util. of tidal power, Decoeur, abs. v 102 -90 *Genie Civil* v 17 -90. See also WAVE motors

**Timber**, expan. due to water absorption, De V. Wood *Am M E* \* v 10 -89; preservation, ed. *Eng* Nov 21-90; use in eng. structures, Apr 1-92; mine tim. preserv. *E & Min* May 30-91; supply vs. R. consumption, Fernow *E News* Oct 25; preserv., Chanute, Dec 13, report (full) *R Gaz* Dec 12-90 *Sc Am Sup* Feb 14, treatment *The Eng* Sep 11, creosote for, Jan 31; Gov't. tests, J. B. Johnson, Nov 28-91; preserv. *E Rec* Dec 20 -90

*Inst C E* expts., want of uniform system, Campbell, abs. v 92; creosoting in New Zeal., Sharp \* v 93 -88; in tropics, the

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teredo Navalis and White ant., James, v 103 -**91**; pine, strength *R & Eng* Apr -**92**; preserv., Reed *R Gaz* Sep 19, creosoting (full) Dec 26-**90**; Am., scientific study of, J. B. Johnson \* Dec 4-**91**; and some of its diseases, Ward (full) *Sc Am Sup* \* Mar 17, 24 \* Apr 7, 28 \* May 5 \* June 2 \* July 28 \* Sep 1, 22, 29-**88**. See also MATERIALS, strength; WOOD

**Time**, uniform standard, com. report *Am C E* v 26 -**92** *R Gaz* Mar 29-**89**, Jan 29-**92**; and cost, short way to keep, Binsse *Am M E* v 9 -**88**; correct, Pritchett *El Eng* July 2-**90**; elec. distrib. of, A. D. Brown *El Rev* June 30 *F Inst* June, July, (full) *Sc Am Sup* Aug 18-**88**; Mayrhofer's system *El Rev* \* July 5-**90**; standard, Gov't. system, Gardner, July 30 *El Wld* July 2-**92**

*E Mag* old-fogy methods of reckoning, Fleming \* May -**91**; standard of, 24 o'clock system *E News* \* Aug 17-**89**; correct, simple method of keeping *Locom* Nov -**88**; standard and 24 hour sys. *R & Eng* May -**89**, uniform, May -**92**; convention *R Gaz* Apr 12-**89**, pro. Apr 11; new notation, Richardson *Sc Am Sup* \* Jan 11-**90**. See also R's, time convention

**Time** checking machine, the Llewellyn *E News* \* Nov 16-**89**

**Tin**, assay, influence of Columbite on, Carpenter *Am Min* v 17 -**89** (contin. p 785); ores, dry assay, Hofman, v 18 -**90** *Tech Q* May, Aug -**90**; alluvial deposits, Siak, Sumatra, Rolker (full) n p 772 *Am Min* \* v 20 -**92**; tin and the tariff, Fletcher *Bost Traveller* Oct 3-**88**; produc., ed. *Eng* July 18-**90**; world's store, Claypole *E Mag* \* Jan; tin plate indus. and English exports, n Mar -**92** *Industries*

*E & Min* Dakota mines, Sep 15-**88**; mines, Malinon \* Aug 31; in No. Car., Ledoux cor. Dec 14-**89**; produc. Aug 30; San Jacinto mines, Cal., Benedict, Oct 18-**90**; in '89 Jan 4 -**90**, in '90, Jan 3; in cen. Tex., Comstock, 24; tin plate manuf., Garrison, abs. Feb 28-**91** *F Inst* Dec -**90**; recov. from tin plate scrap, new method, Schultze, abs. *Inst C E* v 102 -**90** *E & Min* Mar 28; Bolivia mines, Minchin, May 16; U. S. tin plate indus. Dec 12-**91**; market, '91, Jan 2; ore concen. plant at Harney Peak, So. Dak. \* July 30, mines do. Nov 26, Dec 3-**92**

*E News* Am. mines, Emmens, Nov 24-**92**; produc. *Sc Am Sup* Aug 9-**90**; sources of, Merrill, Nov 28; hist. of discov. and use of, Flower, Dec 5-**91**

**Tin** plate cleaning machine, Davies' *E & Min* \* June 27-**91**

- Tires**, Munton proc. manuf. steel, Chic., inset *Eng* \* Oct 17-**90**
- Tobacco**, use of, anal. (effect) Bosworth *Sc Am Sup* Apr 27-**89**;  
(effects) Rochard, Sep 10-**92** *Pop Sci*
- Tools**, cast iron, for cutting metals. O. Smith *Am Min* \* v 19-**91**
- Torey**, Hamilton *Inst CE* v 98-**89**
- Tornadoes**, in U.S., Hazen, notes *E News* Apr 12-**90**. See also STORMS; WIND
- Torpedo** boats, the Halpine *El Rev* \* Oct 19; Sims-Edison fish \* Nov 16; Peral submarine, Webb *El Wld* Oct 19-**89**; Fatum, Italian, inset *Eng* \* Jan 20 *Sc Am Sup* \* Feb 25; 2d class, Yarrow *Eng* \* Apr 27-**88**; Donaldson, Feb 22; Spanish trials report, Mar 29, Apr 12, 19; seaworthiness of, Hovgaard, July 26; Ital. navy \* Dec 6; Brit. navy \* 20-**89**; Sunderland, b. with petrol. fuel, indic. diags. inset, \* Jan 10, Mansel cor. 24. (full) *Sc Am Sup* \* Feb 22; Yarrow's, Dec 20 *Eng* \* Nov 21-**90**; Brazilian navy, sea-going \* Sep 18-**91**  
*E News* the 'Cushing,' trials, Jan 2; U.S. navy, inset \* May 12-**92**; English *R & Eng* Feb, Mar; Nordenfelt submarine \* May *The Eng* Mar 16-**88**; Ital. navy *R & Eng* \* Feb-**90**; Baker submar. \* July-**92**; French, No. 110 *Sc Am Sup* \* May 4; No. 1, structural strength, Drake (full) \* June 29 \* July 6, correction, 13-**89**; Nibbio, Ital. \* Feb 1-**90** *The Eng* Mar 30-**88**; standard, Sep 20-**89**; Turkish Gov't. \* Jan 10; Tartar class \* Nov 14, ed. 21-**90**; French \* Jan 30-**91**, July 15-**92**
- Torpedoes**, the Howell locomotive *The Eng* Aug 17 *Eng* \* Jan 20; Berdan system \* Feb 3; Grenfell, ed. Apr 27; tor. attack, Jaques, Dec 21-**88**; the Victoria \* Aug 29 *Sc Am Sup* \* Oct 11; Whitehead & Howell aut., Ellicott *Eng* \* Nov 14, 28 \* Dec 19, 26-**90** *The Eng* \* Aug 7-21; Sims-Edison elec. *Eng* \* May 1-**91** *Sc Am Sup* \* May 3-**90** \* Mar 5-**92** *The Eng* \* Dec 18-**91**; Canet, discharge tubes (full) *Sc Am Sup* \* Sep 21-**89** *Genie Civil*; marine locom. *The Eng* Feb 24-**88**; the Lege \* Apr 12-**89**
- Torpedo** placing machine, the Fox *R & Eng* \* Feb-**92**
- Torpedo** thrower, aerial, Graydon air gun *Sc Am Sup* \* Dec 15-**88**
- Towers**, Egyptian, light, Minneap. exhib. *El Eng* \* Sep 17-**90**;  
Judson, 1600 ft. *Eng* \* Nov 15-**89**; London, great, proposed, ed. May 2-**90**; iron, Frankfort Elec. exhib. \* Aug 21; U.S. Columb., Chic., Morison's 1120 ft. \* Nov 20 \* Dec 18 *E News* \* Dec 5-**91** *R & Eng* \* Jan-**92** *R Gaz* \* Dec 4-**91**

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*E News* Lathing observ., N. Y., Crystal Pal. exhib., 1853, Nov 23; Douglass har., Isle of Man, Dec 7-**89**; braced iron, cor. \* June 21-**90**; wind strains in, graph. det., Steiner \* Mar 21; leaning, proposed, Halpenny cor. \* Apr 25; Hastings proposed, Columb. exhib., cor. Aug 1-**91**

*E Rec* water tower, Pullman, Ill. \* Dec 28; church spire framing and anchoring \* Jan 12-**89**, steeple \* Dec 20; London great, designs \* May 17, 24, prize \* July 5, Shaw's proposed \* Aug 23; iron clock tower construct. \* Dec 6, prize designs *R & Eng* \* Aug -**90**; U. S. Columb. exhib. n *R Gaz* Oct 23-**91**; tower of Babel, Kircher *Sci Am Arch ed* June -**88**

*Sc Am Sup* London great, proposed, designs \* June 7, 1250 ft., Davey \* July 19-**90**; Proctor steel. U. S. Columb. ex. \* Apr 4, oscil. beam, proposed, O. Smith \* May 30; Lond. Eiffel, Maxwell & Tuke design, n \* Aug 8-**91** *Bld News, Industries*; Lond., designs, 1320 ft. *The Eng* \* May 2, 1550 ft., Ende, 1300 ft., Woodcock, Fairfax \* 9, 9, 1250 ft., Davey \* 23 \* June 6, 1400 ft., R. H. Smith report \* 29, 1200 ft. Stewart (prize) \* 27, 1300 ft., Webster, 2d prize design \* July 4, 1300 ft., Graham \* Aug 15-**90**. See also CHIMNEYS; MONUMENTS; STAND-PIPES

EIFFEL Paris, 1000 ft. *El Wld* \* Apr 20; copyright, ed. *Eng* Apr 12; (full) \* May 3, compared with Forth br. \* 3; elec. plant \* June 21; lifts \* July 5-19; *E & Min* \* Feb 2; inset *E News* \* June 8-**89**; *E Rec* \* Dec 15-29-**88** \* Apr 13 \* May 18, 25 \* June 1-**89**; pressure gauge, Nansouty, abs. *Inst C E* v 105-**91** *Genie Civil* \* v 18-**91**; lifts, Ansaloni, insets *Inst M E* \* July; *R & Eng* Mar; top of *Sci Am* Mar 9; *Sc Am Sup* \* Apr 27 \* June 15 \* July 6, 27; top of *The Eng* \* Jan 4-18, hydr. elevators, Roux \* Mar 22 \* May 10-**89**

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*E News* N. Y. Cen. standard stone ballasted road-bed \* May 19; English, Tratman, July 7, Cunningham (Soc. pro.) Mar 16; the Servis tie-plates, 16, the Stuart \* Apr 27; imp., Tratman \* 27, July 20; track laying, cost, May 25; Dudley's inspection diags. \* June 15; Goldie & Fennerty's grooved spikes, holding power \* Nov 23-**89**

*E News* the Davies steel lock spike \* Apr 19; positive nut-lock, Jeffersonville, O. \* Sep 6: maintenance, Reed \* Aug 30, Hall, Dec 13; Bush interlocking bolts \* 20-**90**; B. & O. standards and rules \* Oct 31; rail section, So. Austral. Gov't. R. \* 31; spikes, tests of various forms, Cox, Dec 5-**91**

*E News* Young reversible nut-lock \* Apr 16; Haarman (German), bk. review, July 28; protect. against torrents and earth-slides in Sicily, Italy \* Sep 15; Prussian St. R's \* Nov 17-**92**; German & Austria-Hungary R's per. way, W. Worthington, abs. *Inst C E* v 95 -**89**; double gauge, 3-rail turnouts for, Geddis (full) *R & Eng* \* Apr - July -**92**

*R Gaz* car wheels, axles and, N. E. R. Club dis. Feb 17; per. way, circular returns, Apr 13; mainten. (cost), Goodwin, May 4, Curtis \* Nov 16-**88**; stone ballast in India, May 3; Am., English and Indian practice, notes, Oct 11; track work, Nov 8-**89**; Jones safety nut lock, n \* Oct 3-**90**; longitud. bearings for, T. C. Clarke, May 29-**91**; N. Y., New Haven standard \* Jan 1; tie plates, Sandberg \* Mar 25; nut locks \* Nov 11-**92**. See also CROSSTIES; R's, curves — spikes — switches — U. S. construct; RAILS, joints — sections

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**Traction**, det., h. p. of tabulated constants, Crane *El Eng* Nov 19-**90**

**Traction** engines, England, descr. and construct., Fletcher *E News* \* Oct 27, ed. Nov 10, and steam road rollers, 10, \* Dec 1 -**92**; spring wheel *The Eng* Dec 7-**88**. See also ROAD engines; STEAM carriage

**Trade**, England and Am. relations, McCormick, ed. *Eng* Apr 8-**92**; Am. and foreign exports and imports *E News* Apr 14-**88**

**Trade**-marks, law of, Sebastian, bk. review *Eng* Dec 19-**90**

**Trade** schools, N. Y., work in, Mead *E Mag* \* Apr -**92**; J. Wilson *F Inst* Feb-Oct; N. Y. *Sc Am Sup* \* Dec 20-**90**

**Trade** unionism, new and old. Howell, bk. rev. *Eng* May 1-**91**

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**Tramways,** Guinness' brewery, Georghegan *Eng* \* Oct 12, insets *Inst M E* \* July -88; the Hunt industrial *E News* \* June 16-92; tramway wagon with steel rails, Wells, descr. *Lehigh Eng J* Apr; steam, for country districts *The Eng* Oct 26, Nov 16-88. See also R's, elec; STREET R's.

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**Travertine** deposits, Mammoth Hot Springs, Yellowstone Park, Weed *E & Min* \* June 13-91

**Trellis** machine, steel *Eng* \* July 25-90

**Trench** brace, Dunn extensible *E News* \* July 7-92

**Trestles,** and pile structures, Western Am. R's, inset *Eng* \* May 20-92; C. B. & N. standard plans *E News* \* Apr 7, May 5, June 9; round timber, Burnt Br. creek, Vancouver, Klickitat & Yakima R., Habersham cor. \* 9; Norfolk & W. stand. plans \* 23; special features in wooden, cor. July 21; design of, ed. 21-88

*E News* timber, for R's., Palmer, July 13; Cleve. & Canton frame \* Nov 2; Wheeling & L. Erie timber \* Dec 7-89; 24° curve on R., Paddock \* May 10-90; Can. Pac. designs \* May 2-91; pile bridges, cost of repairs, Talbot *E Rec* Sep 20-90; and scaffolding, Ziegler's sys., com. report *F Inst* \* Aug -88; R. trestle work, Jameson (full) *R & Eng* \* Dec -89 \* Jan -90

*R Gaz* safety of pile bridges, Apr 26-89; wooden bridges, Foster, Or. & Wash. Ter. R. \* Apr 25, Ft. Worth & Den. City stand. \* May 30, St. P. & Man. \* June 13, 27 July 18 Aug 1, 22 Sep 5, 19 \* Oct 31 \* Nov 21, 28 \* Dec 5, 12-90 \* Jan 2, 30 \* Feb 13; Esquimalt & Nanaimo high \* Feb 6; Minneap. & St. L. pile and. Hixon cor. \* Apr 17; Intercol. R. of Can., deep water \* Oct 2; Halifax har. do., pile \* Dec 25-91. See also BRIDGES, floor-beams and pine stringers, Bates — pile; PILING; PILES

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**Trowbridge,** William P. *Am M E* v 13 -92, por. *E & Min* \* Aug 27, por. *Sc Am Sup* \* Nov 19-92

**Trusts**, and the law, C. Brown *El Eng* June 25; Am. and English, ed. *Eng* Aug 29-**90**

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*E News* manuf. of copper by electricity, Elmore's Aug 9-**90**; spinning and welding metals, Bevington's proc., com. report *F Inst* \* Nov -**91**; spiral weld machin. development, Green, inset \* Mar -**92**; manuf., Robertson cor. *The Eng* Sep 28-**88**; tube making machin., Baraclough \* Oct 23-**91**. See also PIPES

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*E Mag* mod., Moir \* Sep -**91**; building difficulties, Low \* May -**92**; cost of tunneling at Hogsback mine, Placer Cty, Cal., Ralston *E & Min* Aug 24-**89**; submar. and Hudson river tun. \* May 10; timber, Comstock Co. report, Oct 18-**90**; Reno rap. tran. system, under sts. \* Feb 21-**91** *E News* \* Feb 27 \* Apr 21-**92**, (full) *R Gaz* \* June 12-**91**

*E News* rock, bottom vs. top heading in, Kahnbach \* Mar 24; Can. Pac. R., sections, T. Thomson \* Nov 24-**88**; suba-

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*E Rec* Mil. flushing (sewer) \* Dec 8-**88**; arch, shield for removing, Caled. R. \* May 7; tunneling in loose ground, Vyrnwy aq., Deacon, abs. Aug 27 *The Eng* 19-**92**; ventil., three Alpine, Pürzl, abs. *Inst C E* v 106 -**91**; relining, in use, the Saulzaie, Libeaux, n *R & Eng* \* July -**89**; tunneling under heavy pressures, Schenck *R Gaz* \* Apr 10 \* May 8; ventil. of, ed. Oct 30-**91**. See also **BLASTING**; **EXPLOSIVES**; **MINES** and mining; R's, underground; **SEWERAGE** and sewers. Brooklyn main relief; **WATER-works**, N. Y., Croton aq. excav., etc.

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BALT. Belt Line, York road, inset *E News* \* Jan 9 *R Gaz* \* Aug 5 *St R J* \* Aug -**92**

BALT. & Potomac ventil. plant *E News* \* Oct 20-**92**

BETCHWORTH, Dorking, Lond. & Br. R., repairing *E News* \* Apr 20, Lopes *Inst C E* \* v 95 -**89**

BIG Bull, Norfolk & W. R. *E News* \* June 9-**92**

BLACKWALL highway, under Thames river, Lond. *E News* \* June 16-**92**

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- WICKES, Mont. Cen. R. *R Gaz* \* June 22-**88**
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*E News* statistical abs., bk. n, debt per capita, Nov 24-**88**; naval prog. '89, Jan 12; mineral devel. Mar 23; a century of prog., pop., R's, water-works, colored inset diags, ed. \* Apr 27; and Can., pop. growth, 1790 to 1880, 27; taxes, June 1-**89**; census of 1890, ed. Nov 8-**90**

*E News* center of pop., 1790 - 1890, map \* Mar 7; pat. system, past and present, ed. Apr 18; receipts and expenditures of 100 cities, July 4; Pacific slope, growth and resources, ed.

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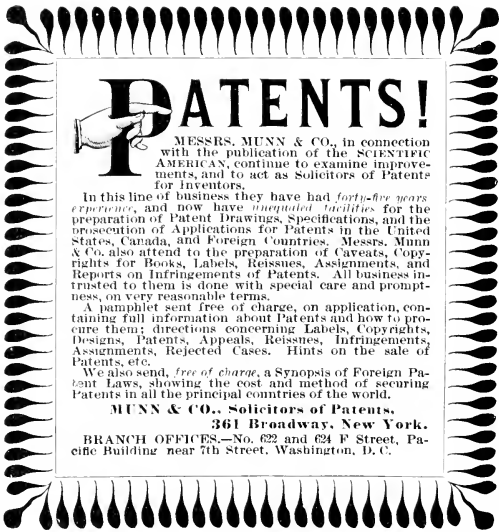
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